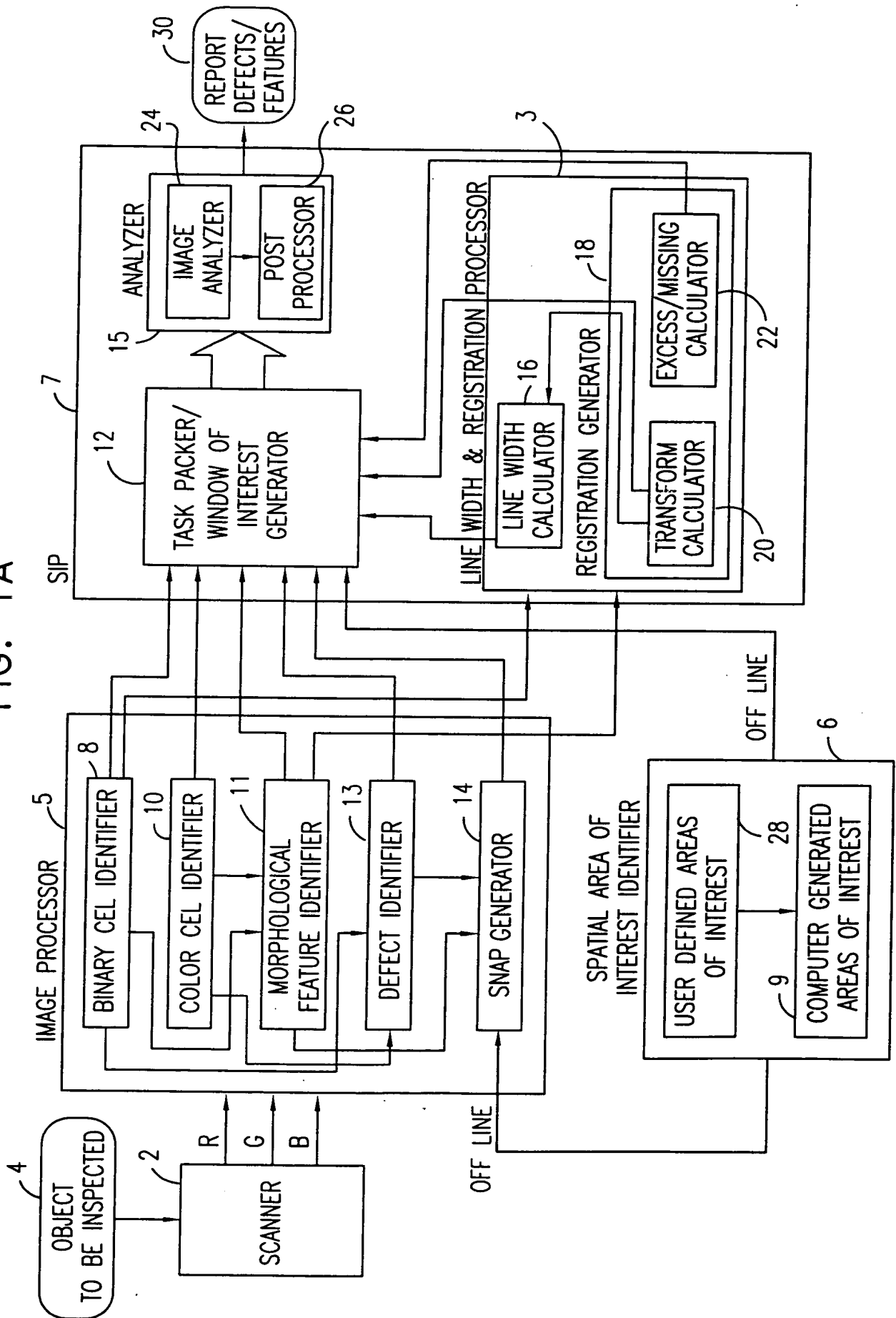


FIG. 1A



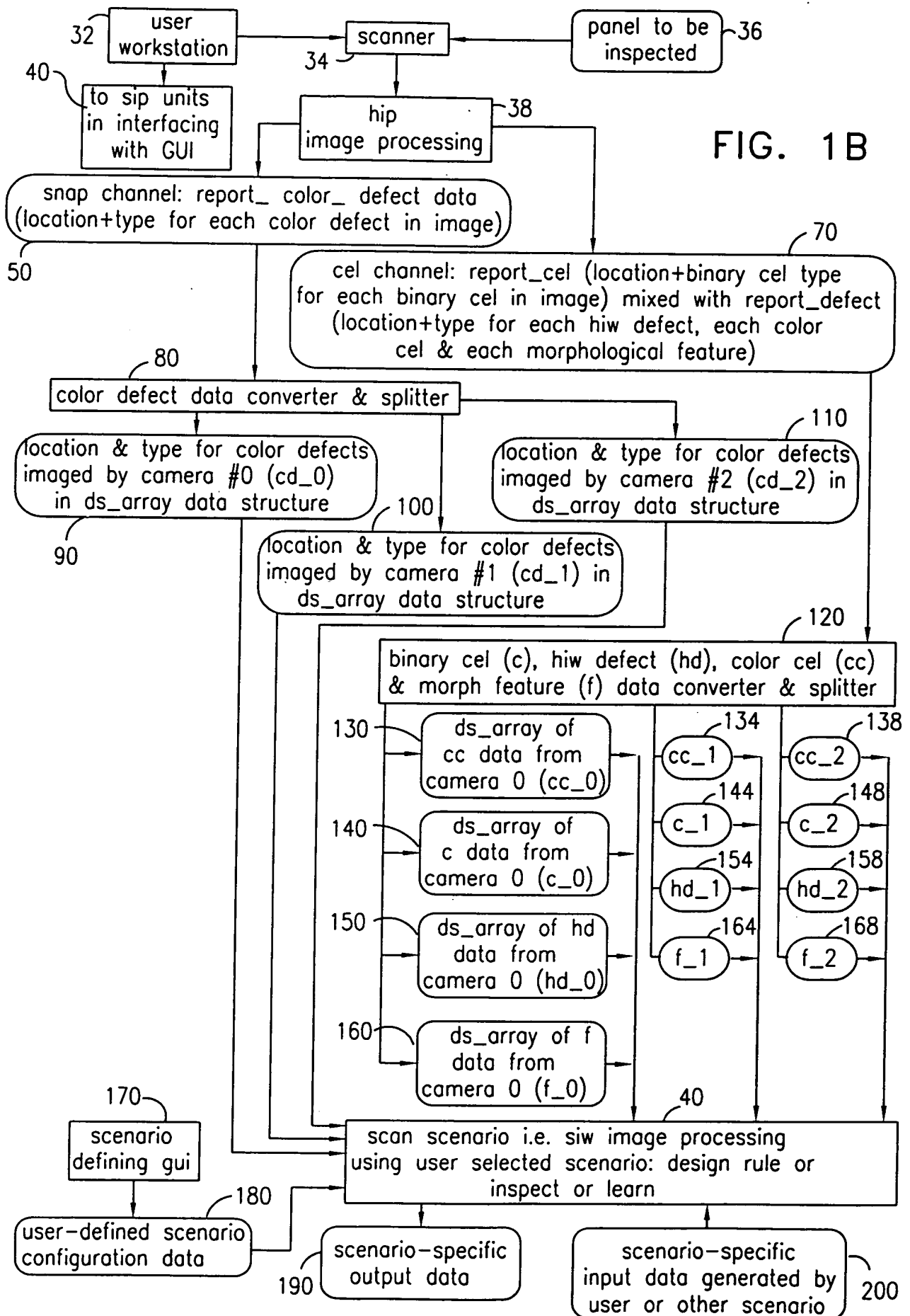


FIG. 2

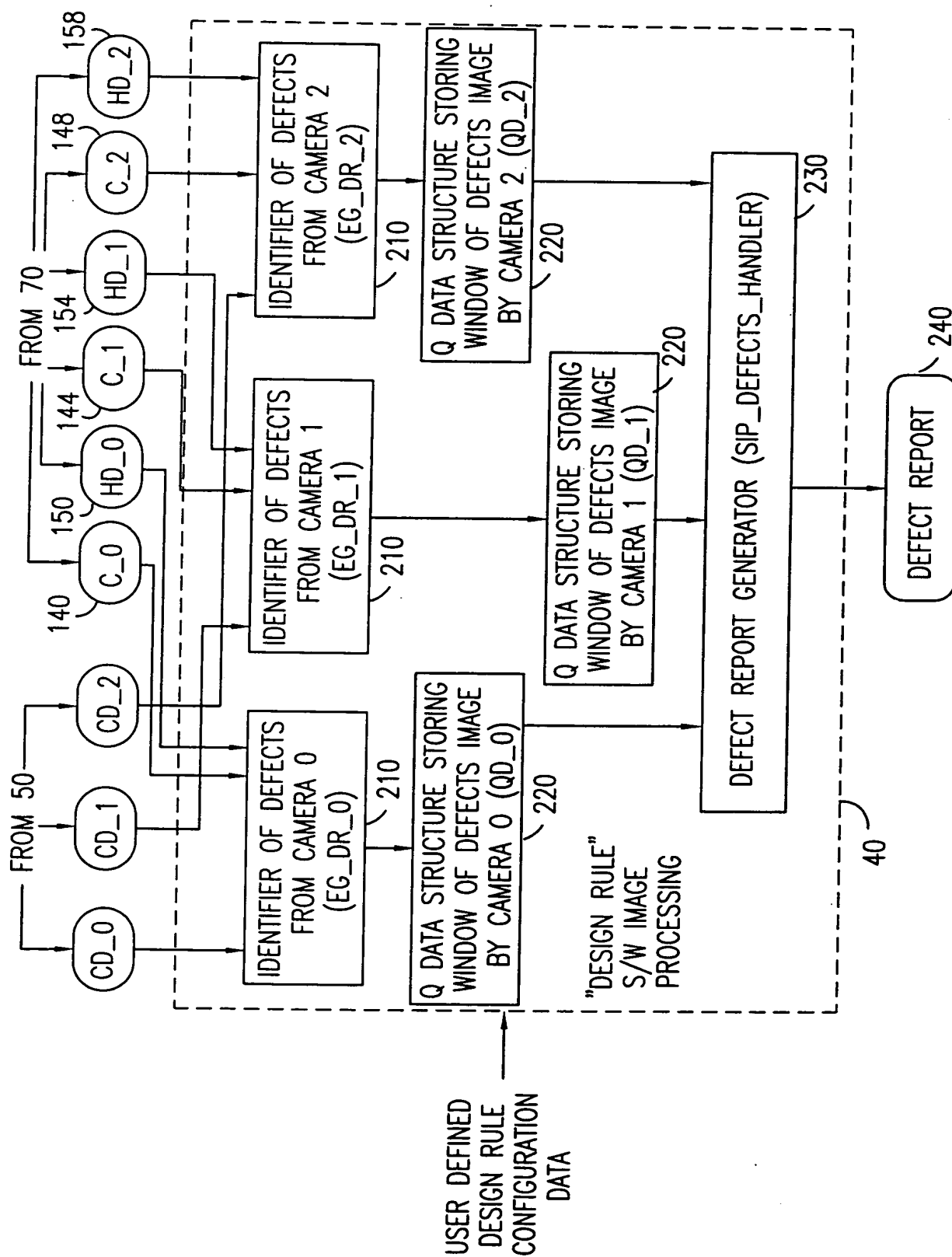
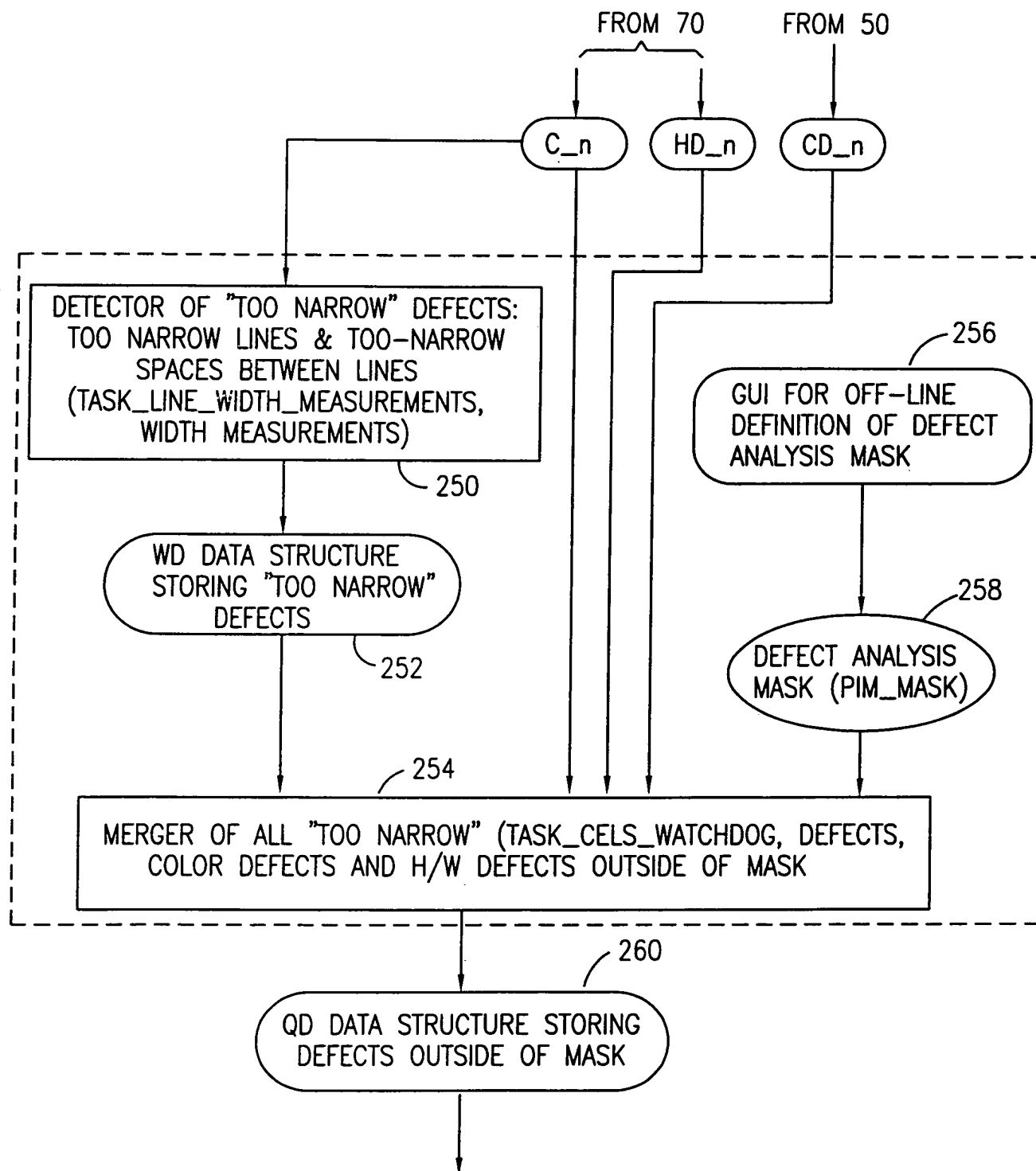
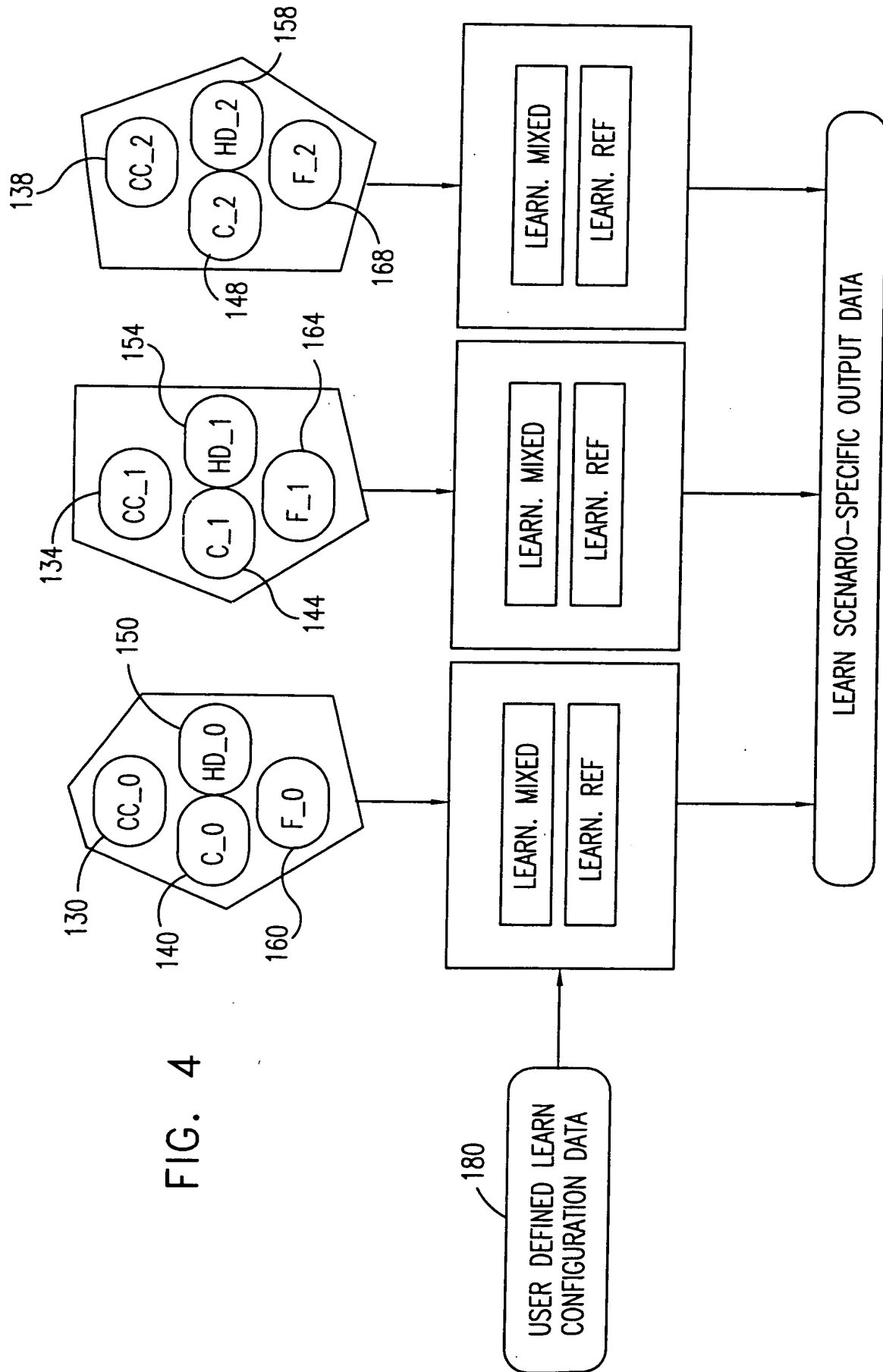


FIG. 3





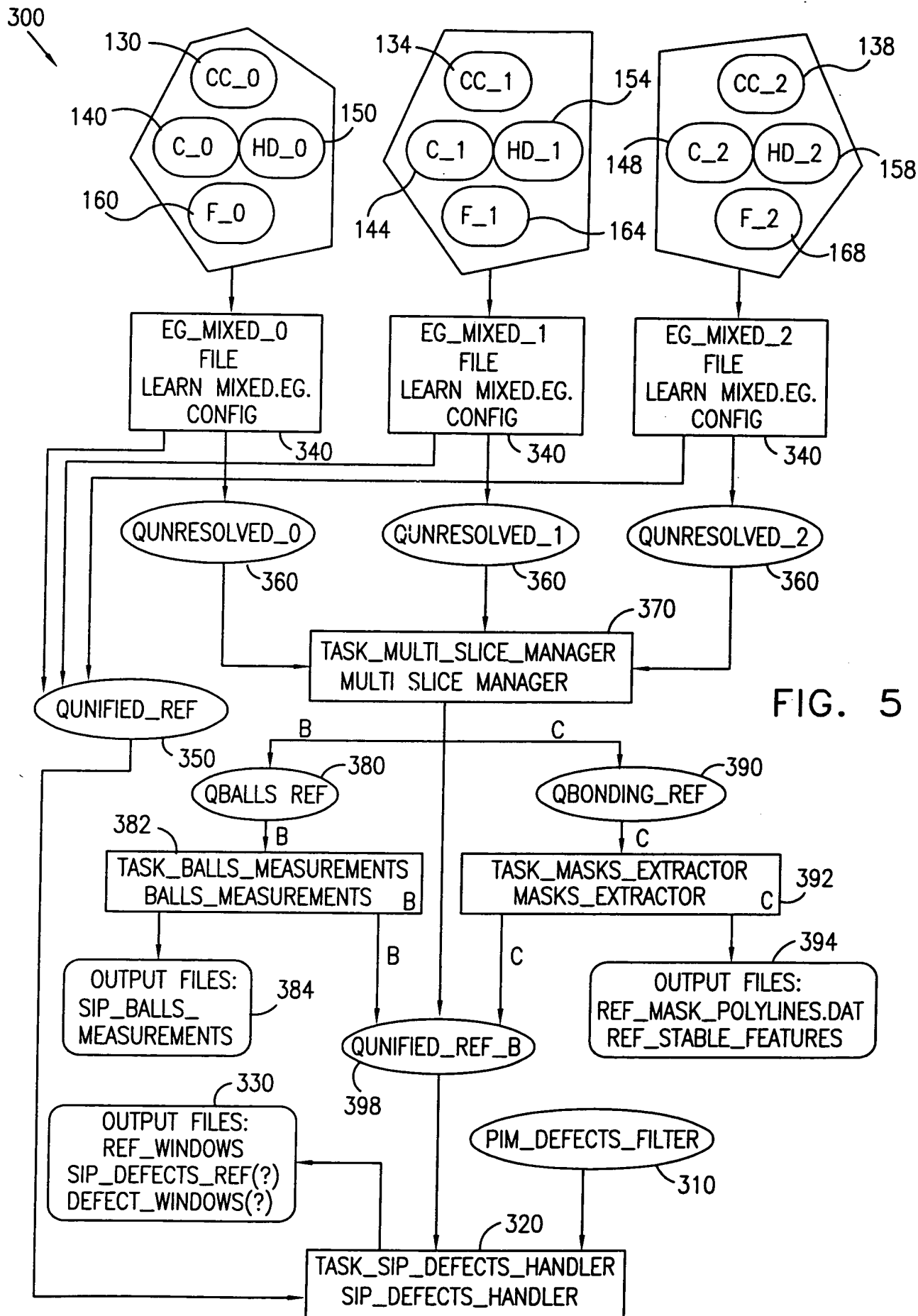


FIG. 6

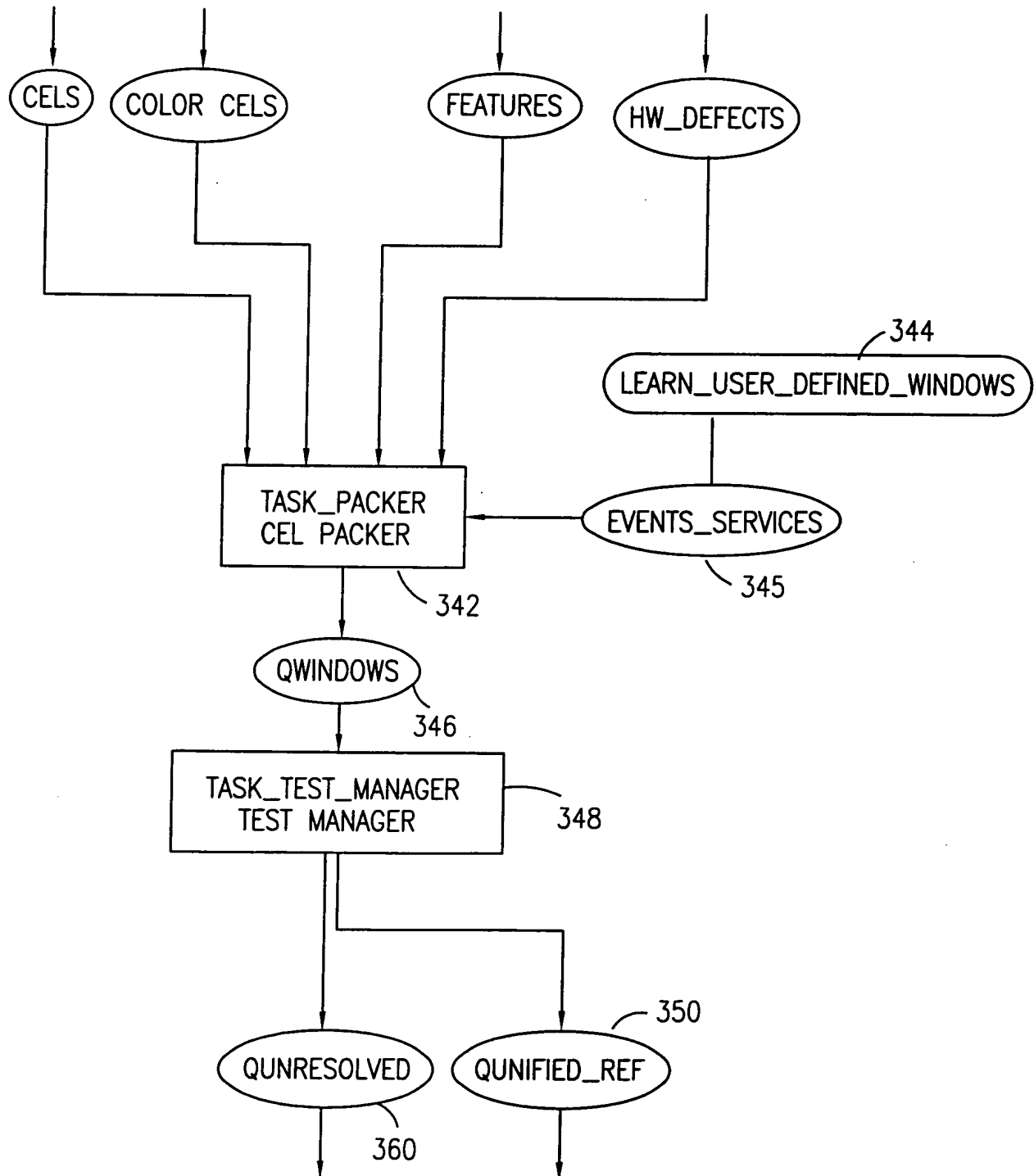


FIG. 7A

Window type	Functions attached	Remarks
target	<u>target lrn:</u> connect_closed (Func_connected_components<CEL>) vectorize (Func_angle_vectorizer<Cel>) target_reference (currently does nothing) trans2ref (Func_trans2ref) forward2target_analyze (Func_forward)	Produces connected components of raw CELs. Vectorizes them into polylines. Then transforms vectorized polylines into reference aligned coordinated system (removing all non transformable data). Finally the window is forwarded into destination unresolved and the function that is attached to the window at its new destination is target_analyze.
bonding_area	<u>ii lrn</u> connect_closed (Func_connected_components<CEL>) vectorize (Func_angle_vectorizer<CEL>) connect_open_color (only in enable_color_masking mode) (Func_connected_components<Color_cel>) vectorize_color (only in enable_color_masking mode) (Func_angle_vectorizer_<Color_cel>) stp_reference trans2ref (Func_trans2ref) forward2bonding_analyze (Func_forward)	Produces connected components of raw CELs, vectorizes them into polylines. If in enable_color_masking mode is then connected components of raw color CELs are also computed, and then vectorize them into polylines. The function stp_reference of type Func_stp_top_down_ref is called to learn bonding area and to create the single camera component of the reference including bonding pads windows, masks zones and stable features for registration. Then all transformable data is transformed into reference aligned coordinate system (removing all non transformable data). Finally the window is forwarded into destination unresolved and the function that is attached to the window at its new destination is bonding_analyze.
chip_area	nop (nop function)	Nothing is done with this window. It is only used within bonding_area window in function stp_reference.

FIG. 7B

Window type	Functions attached	Remarks
balls	<u>balls ins</u> connect_open (Func_connected_components<CEL>) vectorize (is needed only for debugging and visualization of balls algorithms) Func_angle_vectorizer<CEL>) circles_process (Func_circles_process) trans2ref (Func_trans2ref) forward2balls_analyze (Func_forward)	<p>Produces connected components of raw CELs. Then vectorize them into polylines. This step is not really needed for the algorithm but it provides a nice picture to look at when visualizing the outcome of the algorithm. The function circles_process of type Func_circles_process is called to model the connected components as what are called generalized circles (balls).</p> <p>Then all transformable data is transformed into reference aligned coordinate system (removing all non transformable data). Finally the window is forwarded into destination unresolved and the function that is attached to the window at its new destination is balls_analyze.</p>
cavity	<u>alarms lrn</u> watchdog-func (Func_watchdog) trans2ref (Func_trans2ref) forward2ref_if_in_camera (Func_forward)	<p>Function watchdog checks to see if there are CELs inside the window. Any CEL found inside the window is reported as defect. Then all transformable data is transformed into reference aligned coordinate system (removing all non transformable data). Finally, if the window is completely within camera boundary then the window is forwarded into destination reference and the function that is attached to the window at its new destination is nop. If the window is not within camera boundary then the window is not forwarded.</p>

FIG. 8

Function name	Functions executed	Remarks
balls_analyze	analyze_circles balls_create_ref balls_display (for display and debug only) merge_defects forward2balls_ref (Func_forward)	Classifies circles based on data coming from three cameras. Creates circles reference. Merges all defects from cameras into main unified data. Finally the window is forwarded into destination unified_balls_reference_defects_queue and the function that is attached to the window at its new destination is strip_balls.
bonding_analyze	analyze-bonding-side forward2bonding_ref (Func_forward)	Megre data from all three cameras into unified reference format. Finally the function is forwarded into destination unified_bonding_reference_defects_queue and the function that is attached to the window at its new destination is strip-bonding.
target_analyze	analyze_target forward2target_ref (Func_forward)	Megre data from all three cameras into unified reference format. Finally the function is forwarded into destination unified_reference_defects_queue and the function that is attached to the window at its new destination is strip_target.

FIG. 9

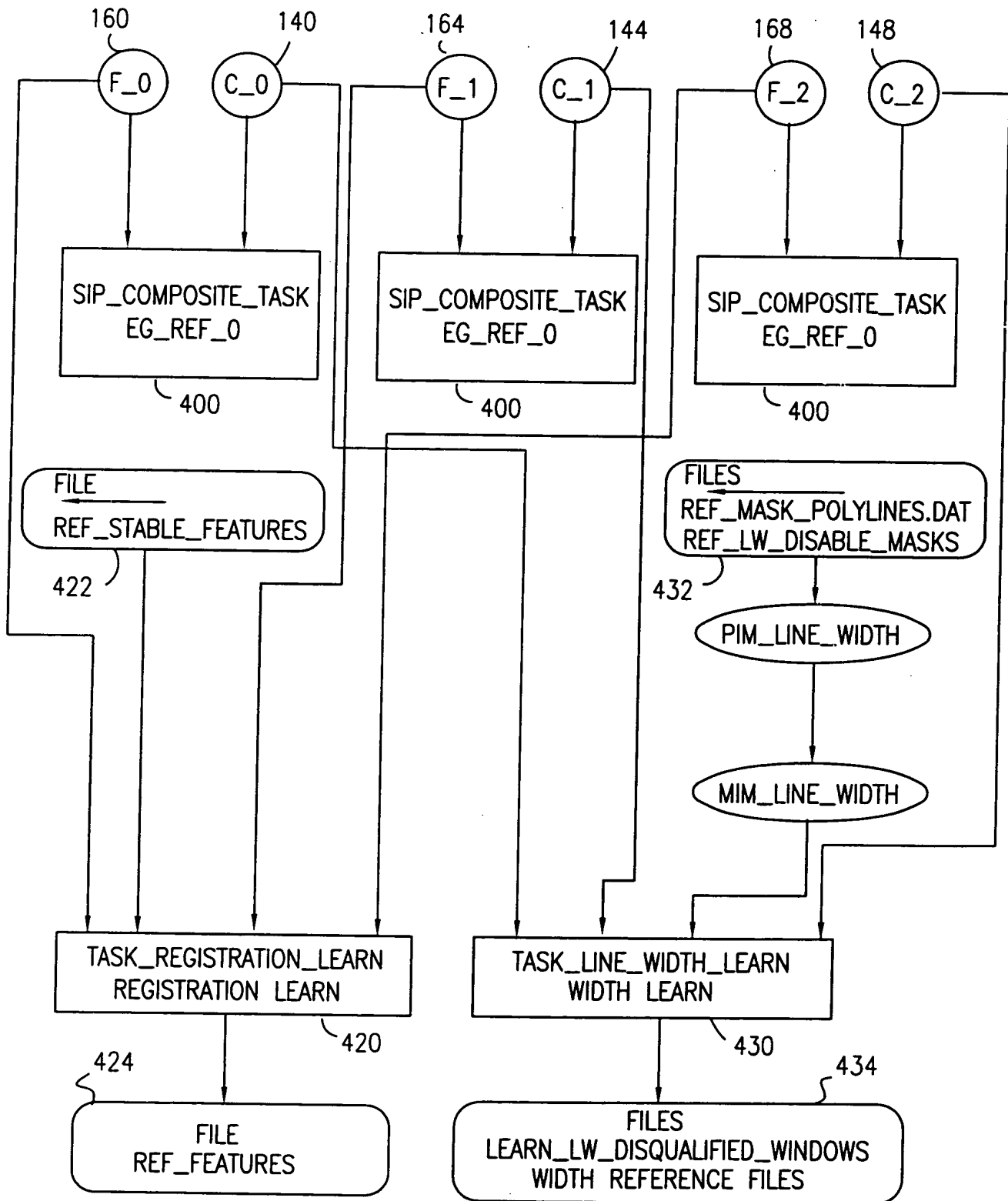


FIG. 10

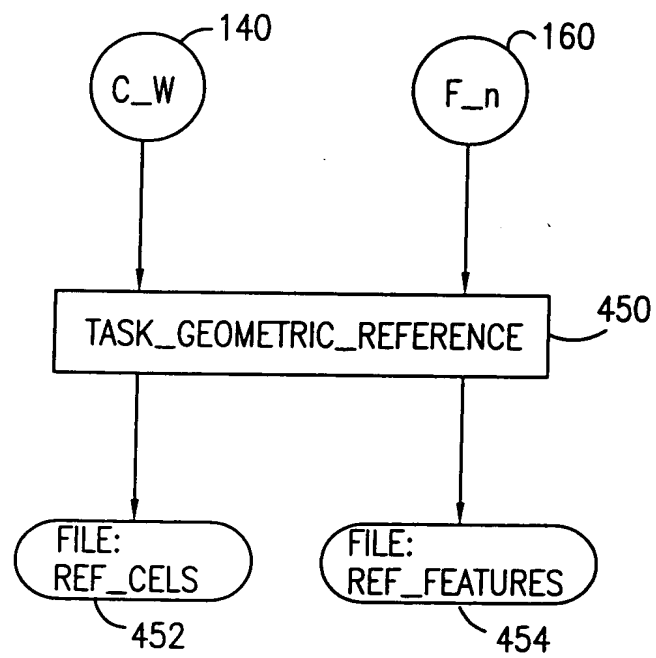


FIG. 11

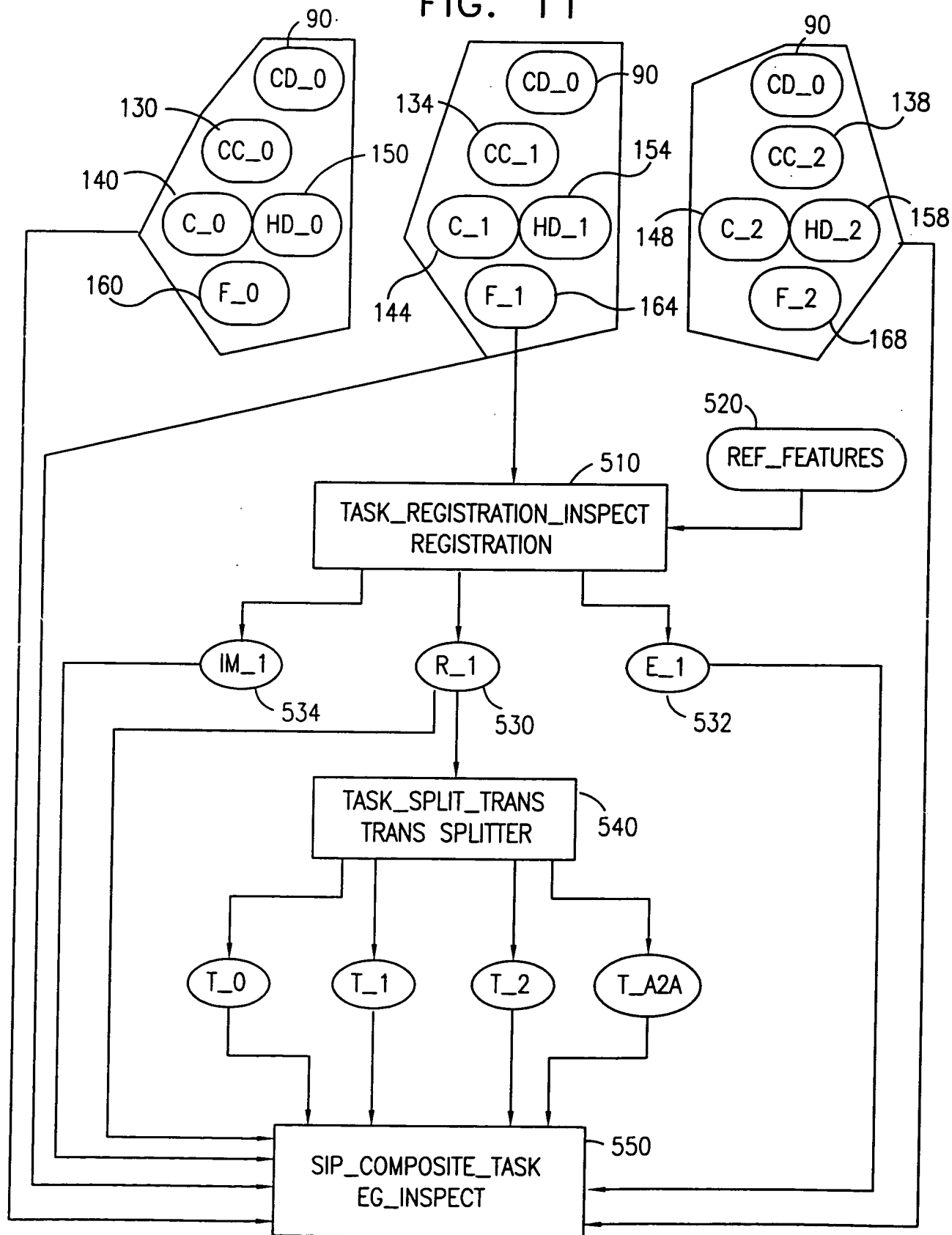


FIG. 12

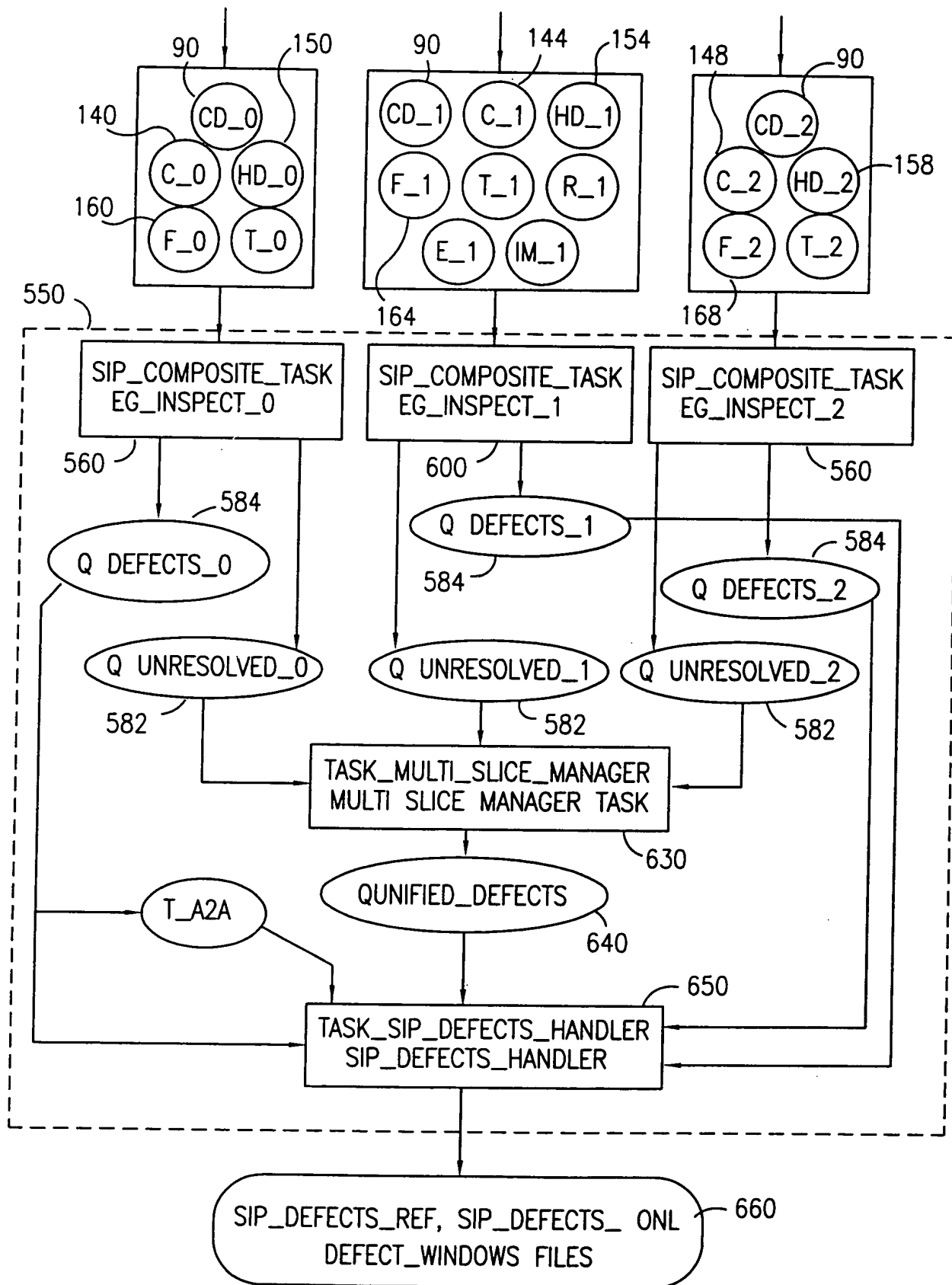


FIG. 13

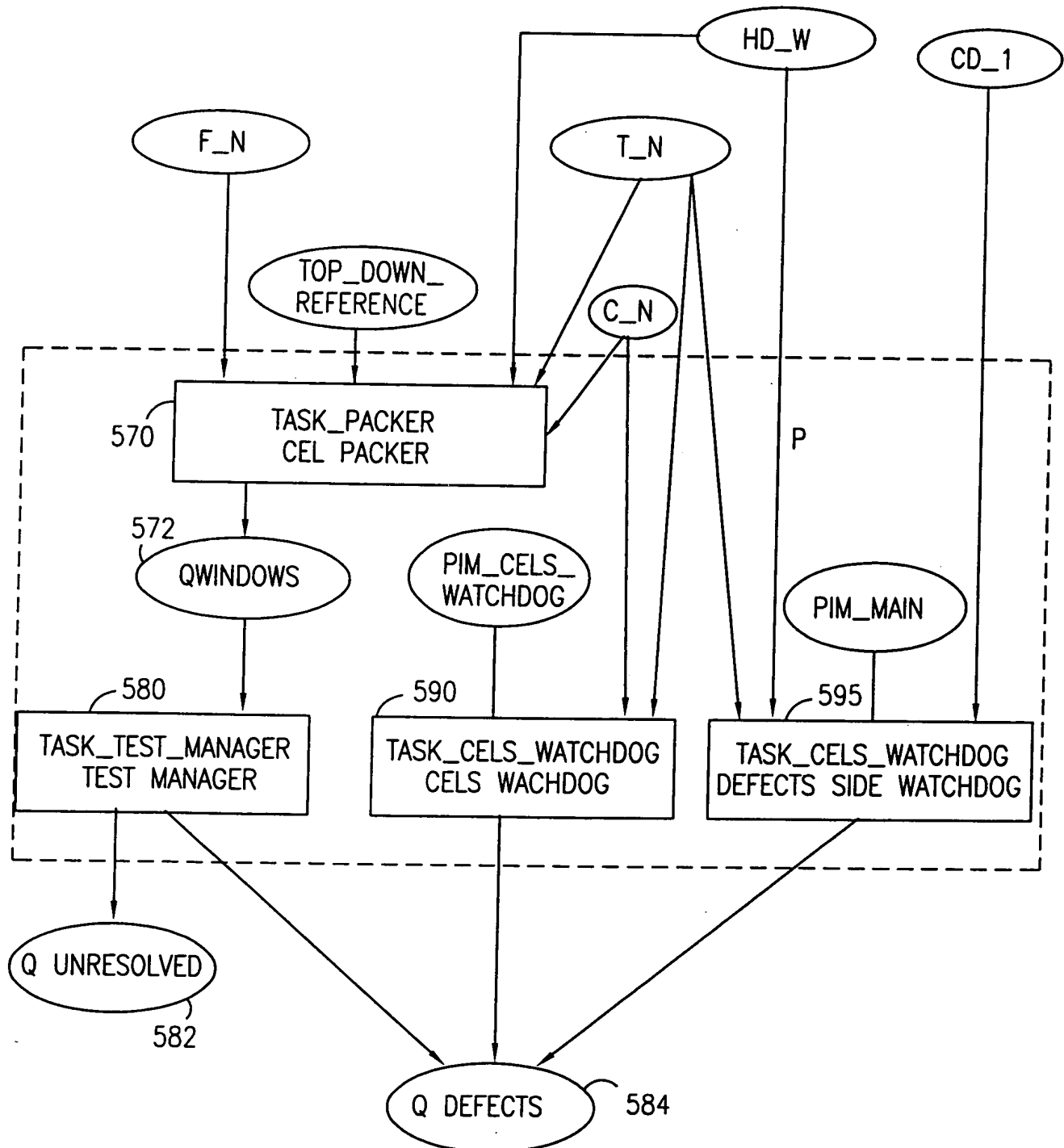


FIG. 14

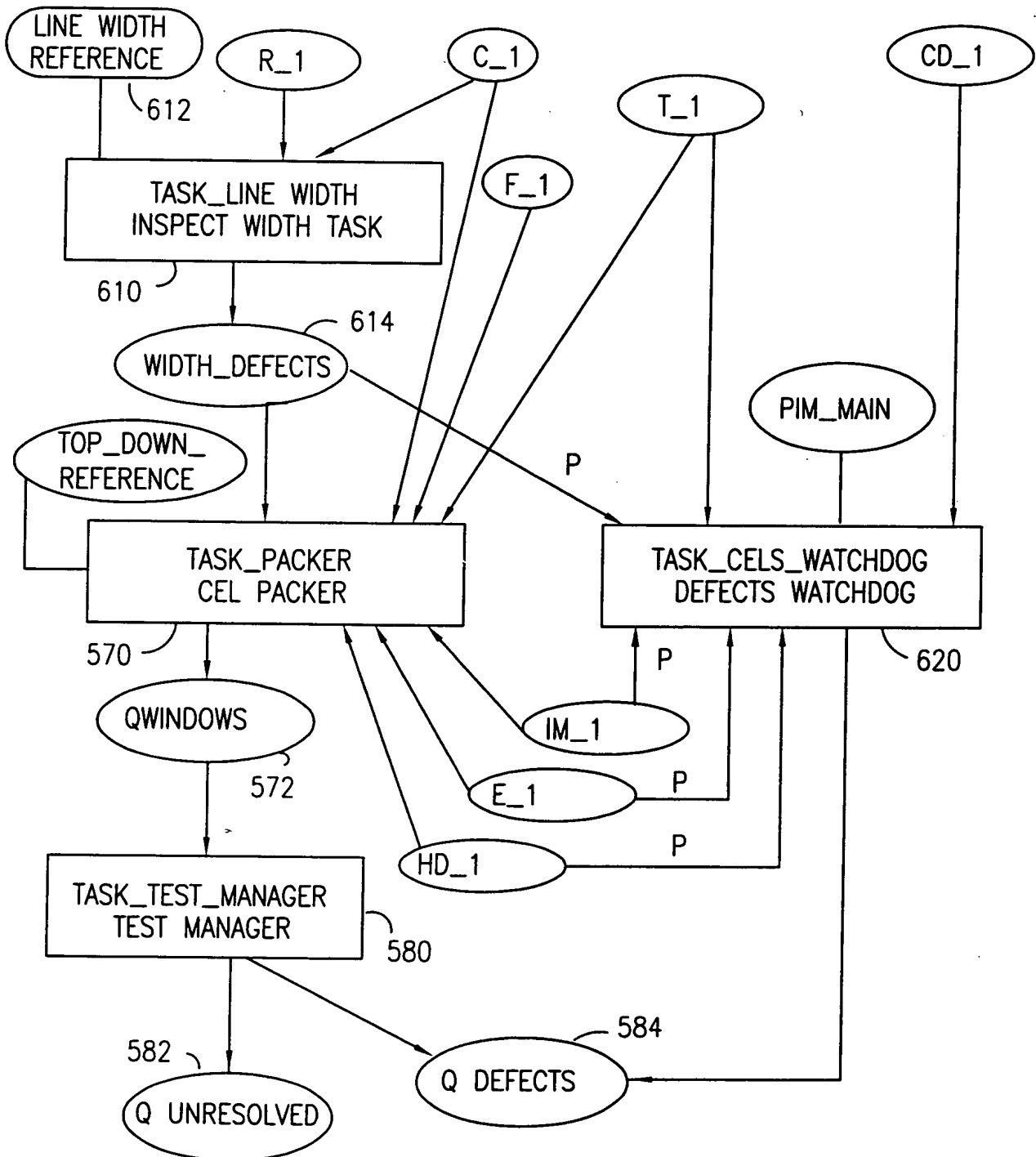


FIG. 15A

Window type	Functions attached	Remarks
target	<u>poly compare target:</u> polylines_comp_aaa_target (func_polylines_comp_aaa) defects_handler (Func_defects_handler) defectsfiler (Func_defects_filer) forward2defects (Func_forward)	<p>Function polylines_comp_aaa_target of type func_polylines_comp_aaa do a CEL2VEC comparison between reference polygons and online CELs based on application target tolerances.</p> <p>Function defects_handler of type Func_defects_handler is a post processing function that decides which of the defects reported by the various defect detectors (nick, protrusion, width defect CEL2VEC, excess/missing, etc.) are real Sip_defects. Defects found by a detector are rechecked according to zone specific application criteria.</p> <p>Function defectsfiler is of type Func_defects_filer is called to filter out any defects. It uses PIM_main and filters out all defects found in one or more regions of the following: unstable, mask_region, power_line_default.</p> <p>Finally, if any Sip_defects are inside the window, then the window is forwarded into destination defects and the function that is attached to the window at its new dimension is nop (nothing to do). If no defects are found, then the window is not forwarded at all.</p>
pad_ref	<u>poly compare pads</u> polylines_comp_aaa_target (func_polylines_comp_aaa) defects_handler (Func_defects_handler) defectsfiler(Func_defects_filer) forward2defects(Func_forward)	<p>This function connected to this window type is similar to the function connected to the target window above. The only difference is that parameter applications are used for bonding pads to control the behavior of the CEL2VEC function.</p>

FIG. 15B

Window type	Functions attached	Remarks
balls	<u>balls ins</u> connect_open (Func_connected_components<CEL>) vectorize (is needed only for debugging and visualization of balls algorithms) Func_angle_vectorizer<CEL> circles_process (Func_circles_process) trans2ref (Func_trans2ref) forward2balls_analyze (Func_forward)	<p>Produces connected components of raw CELs. Then they are vectorized into polylines. This step is not really needed for the algorithm but it provides a nice picture to look at when visualizing the outcome of the algorithm. The function circles_process of type Func_circles_process is called to model the connected components and are called generalized circles (balls). Then all the transformable data is transformed into reference aligned coordinate system (removing all non transformable data). Finally the window is forwarded into destination unresolved and the function that is attached to the window at its new destination is balls_analyze.</p>
cavity	<u>watchdog</u> watchdog_func (Func_watchdog) defectsfilter (Func_defects_filter) forward2defects (Func_forward)	<p>Function watchdog checks to see if there are CELs inside the window. Any CEL which is found inside the window is reported as a defect.</p> <p>Function defectsfilter is of type Func_defects_filter is called to filter out any defects. It uses PIM_main and filters out all defects found in one or more regions of the following: unstable, mask_region, power_line_default.</p> <p>Finally, if any Sip_defects are found inside the window, then the window is forwarded into destination defects and the function that is attached to the window at its new destination is nop (nothing to do). If no defects are found, then the window is not forwarded at all.</p>

FIG. 15C

Window type	Functions attached	Remarks
reject	<p data-bbox="370 646 699 680">poly compare and reject</p> <p data-bbox="370 737 699 814">polylines_comp_and_reject (func_polylines_comp_aaa)</p> <p data-bbox="370 919 699 953">Forward2defects (Func_forward)</p>	<p data-bbox="735 657 1382 1016">Function polylines_comp_and reject does a CEL2VEC comparison between reference polygons and online CELs based on application target tolerances. This function has a very small limit to the number of excess CELs or missing envelopes permitted. If there is even a small change between reference target and online target overflow type defects are obtained which are interpreted by the application as an indication that this frame should be rejected.</p> <p data-bbox="735 1150 1357 1367">Finally, if any Sip_defects is found inside the window, then the window is forwarded into destination defects and the function that is attached to the window at its new destination is nop (nothing to do). If no defects are found, then the window is not forwarded at all.</p>
disqualified _lw_win	nop	Do nothing

FIG. 16

Function name	Functions executed	Remarks
balls_analyze	analyze_circles (Func_circles_analyze) balls_compare2ref (Func_compare2ref) balls_display (for display and debug only. Func_display_balls_info) Merge_defects (Func_merge_defects) forward2defects (Func_forward)	<p>Classify circles based on data coming from three cameras. Compare unified circles to reference. Merge all defects from cameras into main unified data.</p> <p>Finally, if any Sip defects are found inside the window, then the function is forwarded into destination defects and the function that is attached to the window as its new destination is nop (nothing to do). If no defects are found, then the window is not forwarded at all.</p>

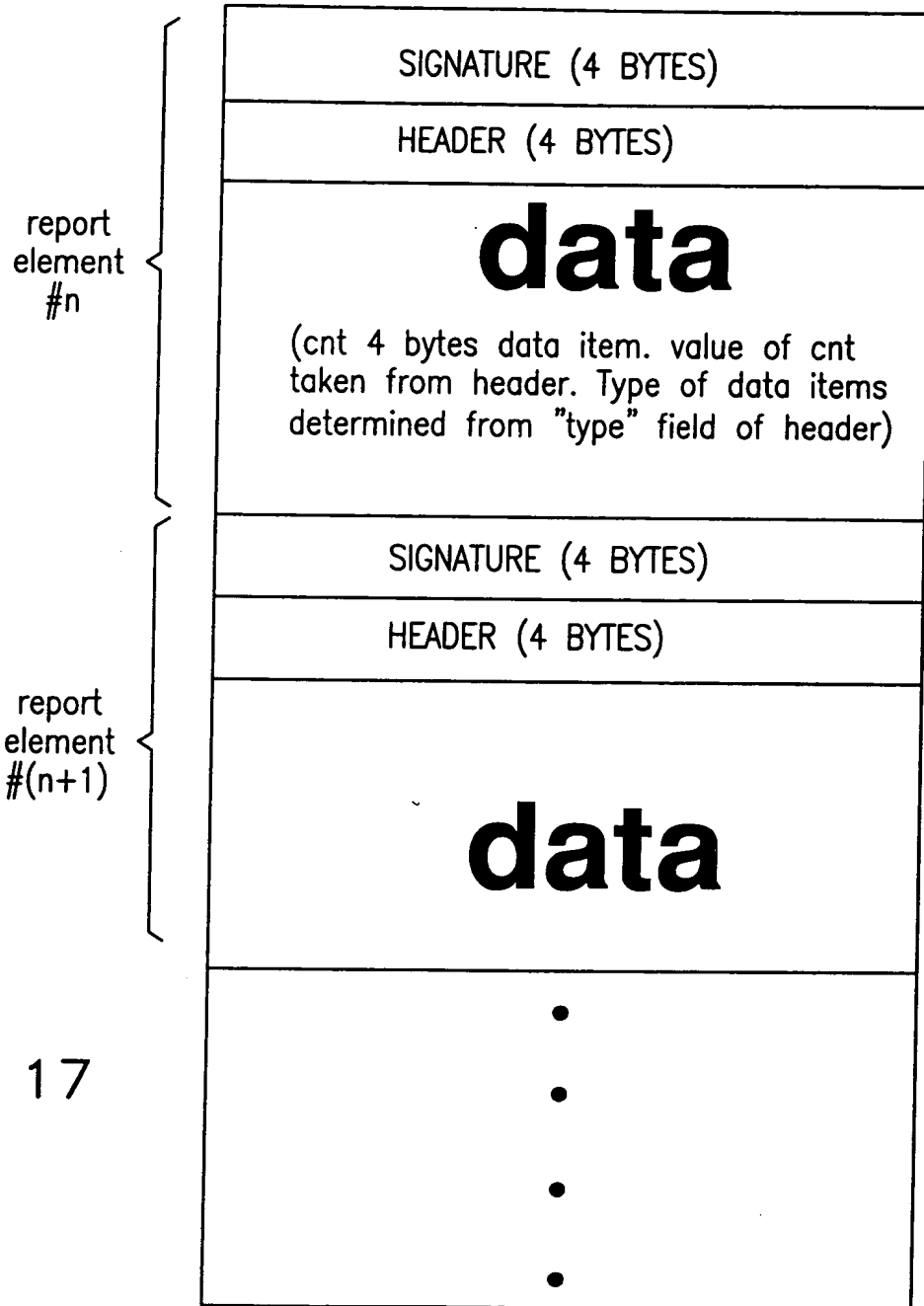
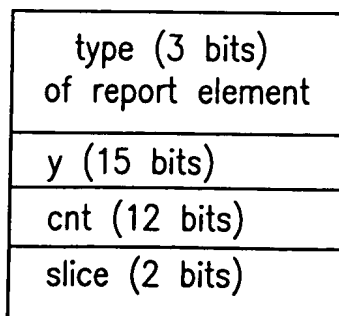


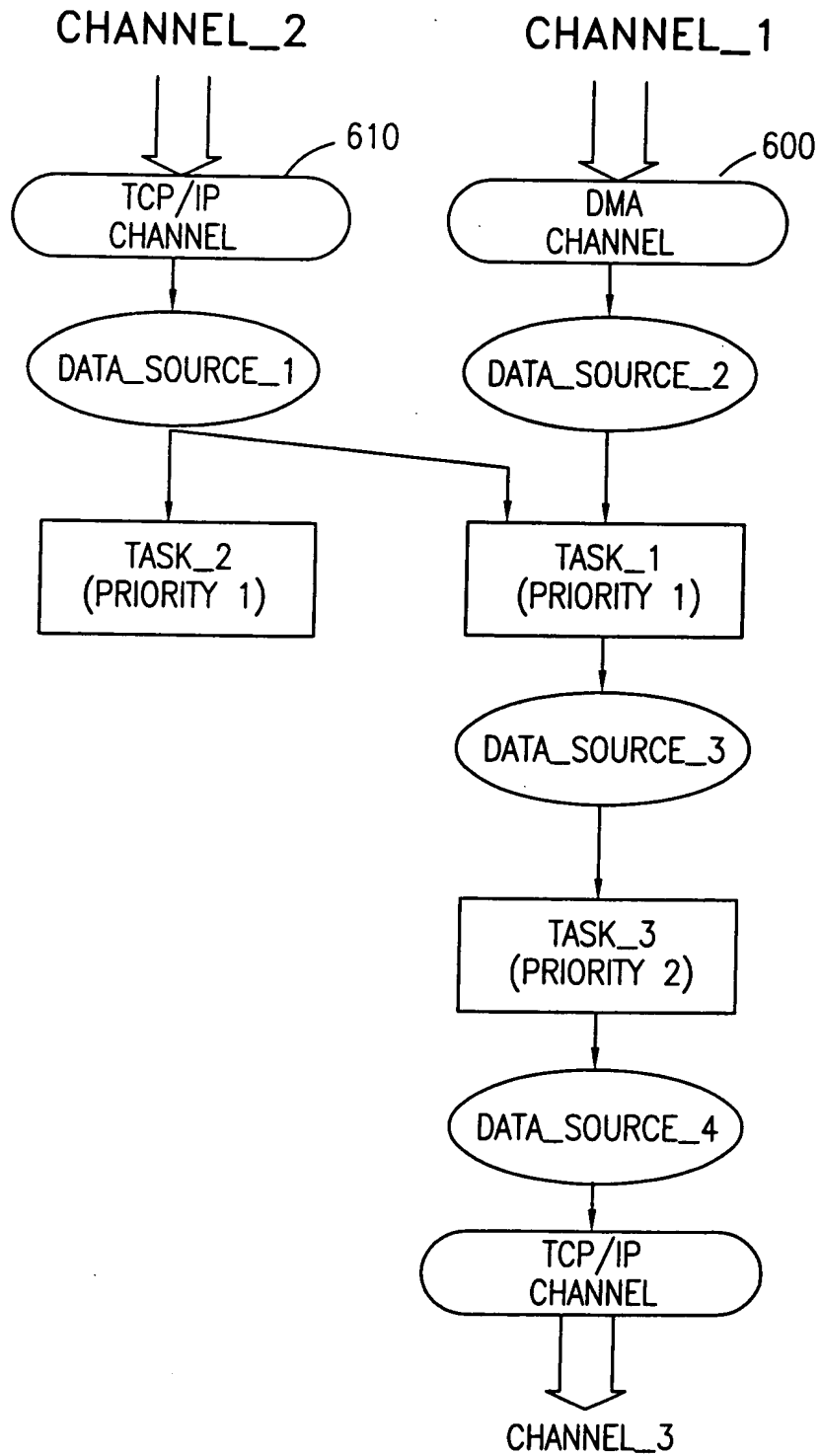
FIG. 17

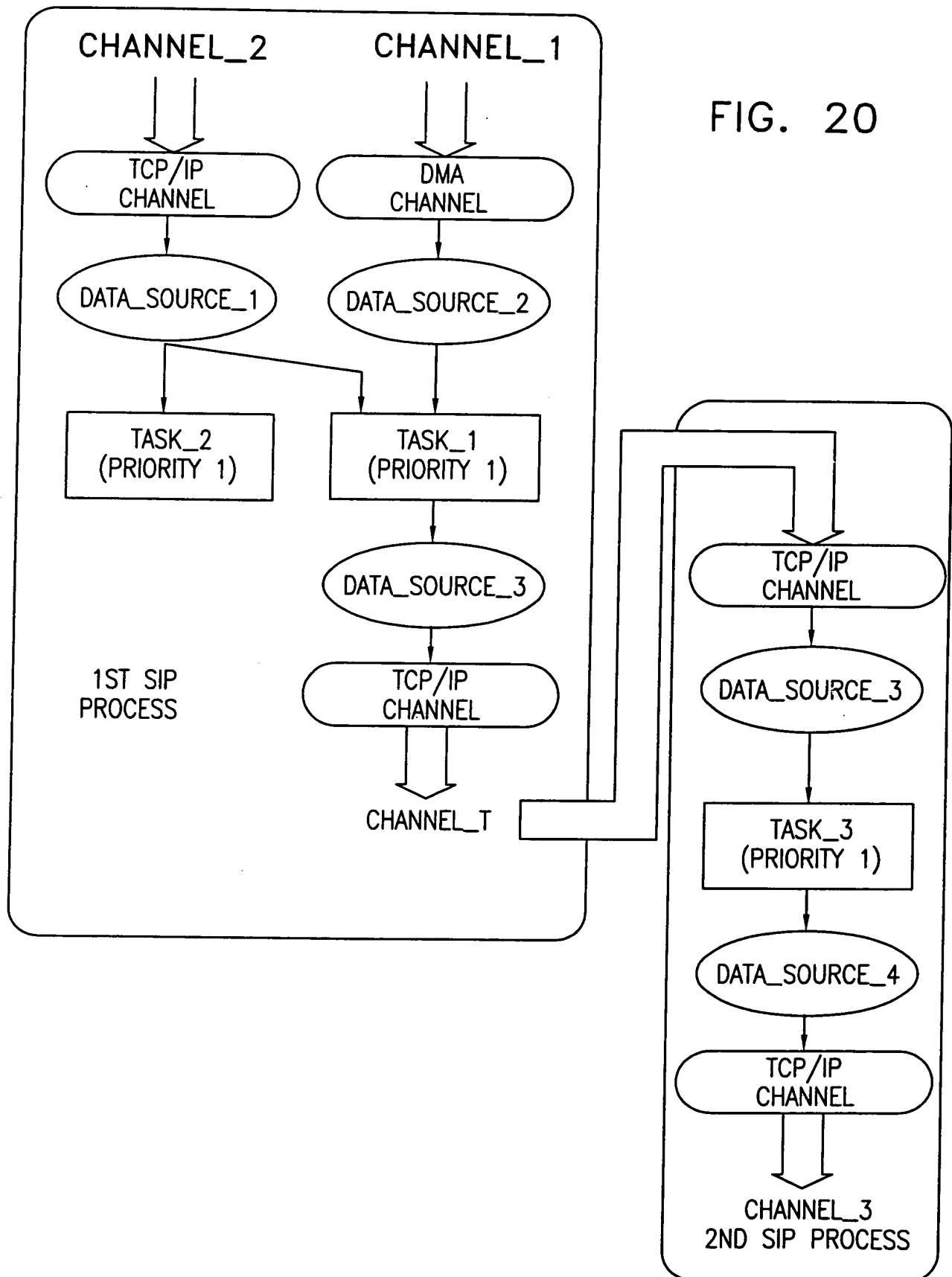
FIG. 18

legal values for type

- 0 : REPORT_NO_TYPE
- 1 : REPORT_COLOR_DEFECT
- 2 : REPORT_DEFECT
- 3 : REPORT_CEL
- 4 : REPORT_SNAP

FIG. 19





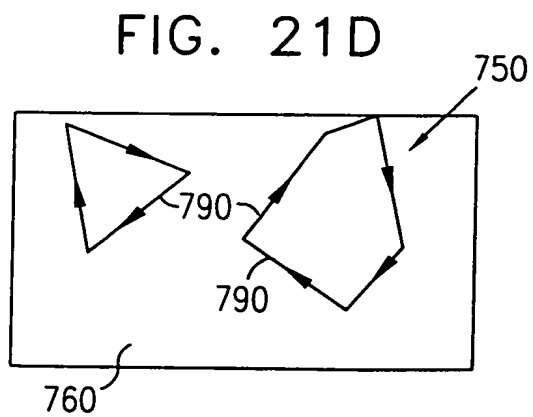
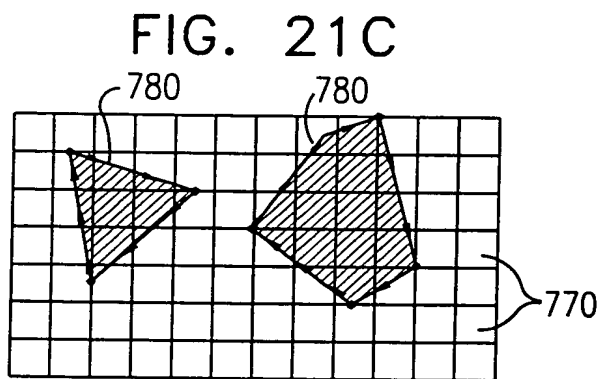
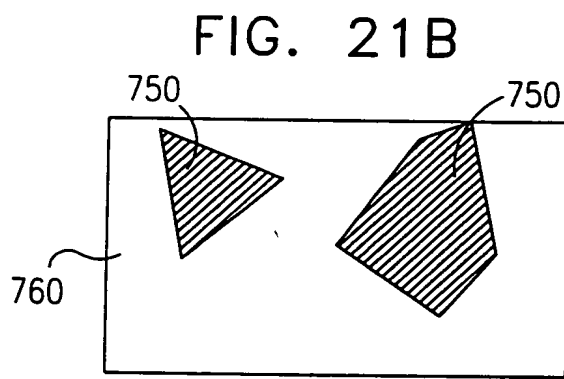
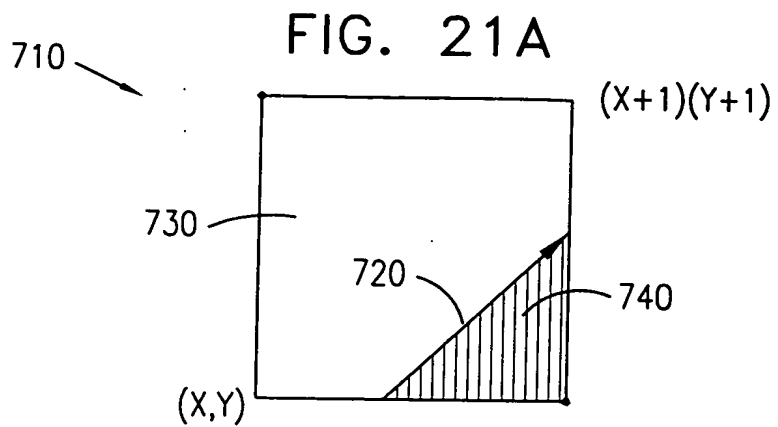


FIG. 22A

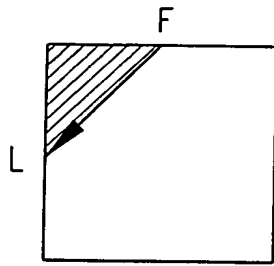


FIG. 22B

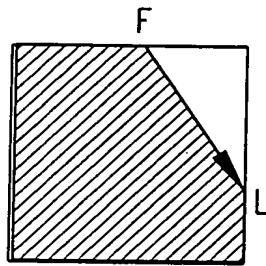


FIG. 22C

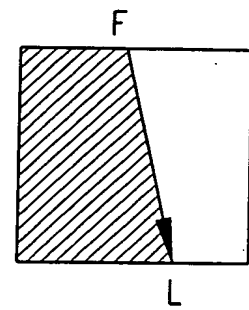


FIG. 22D

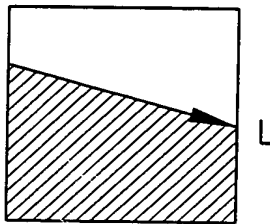


FIG. 22E

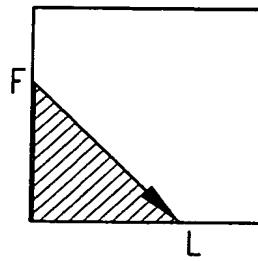


FIG. 22F

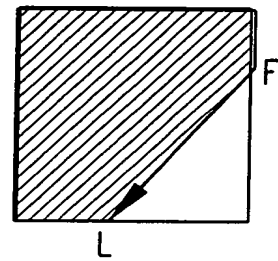


FIG. 22G

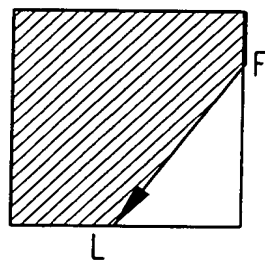


FIG. 22H

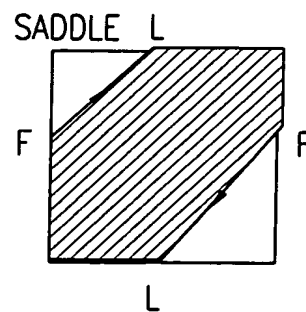


FIG. 23A

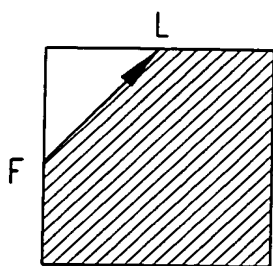


FIG. 23B

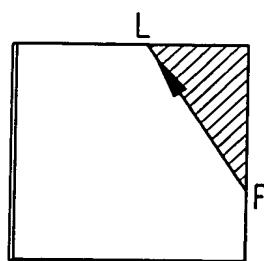


FIG. 23C

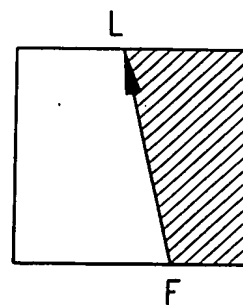


FIG. 23D

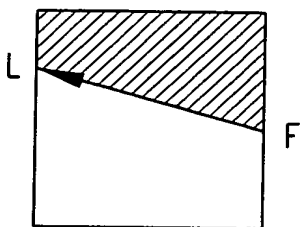


FIG. 23E

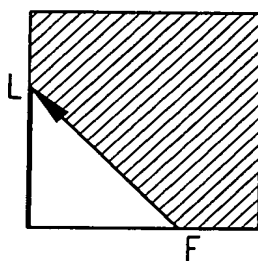


FIG. 23F

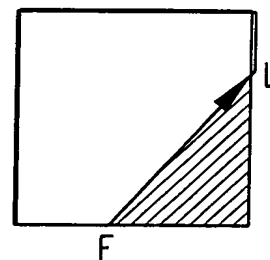


FIG. 23G

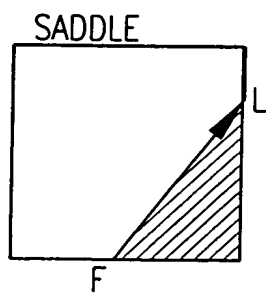


FIG. 23H

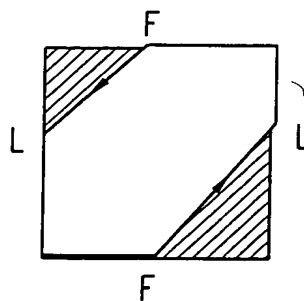


FIG. 23I

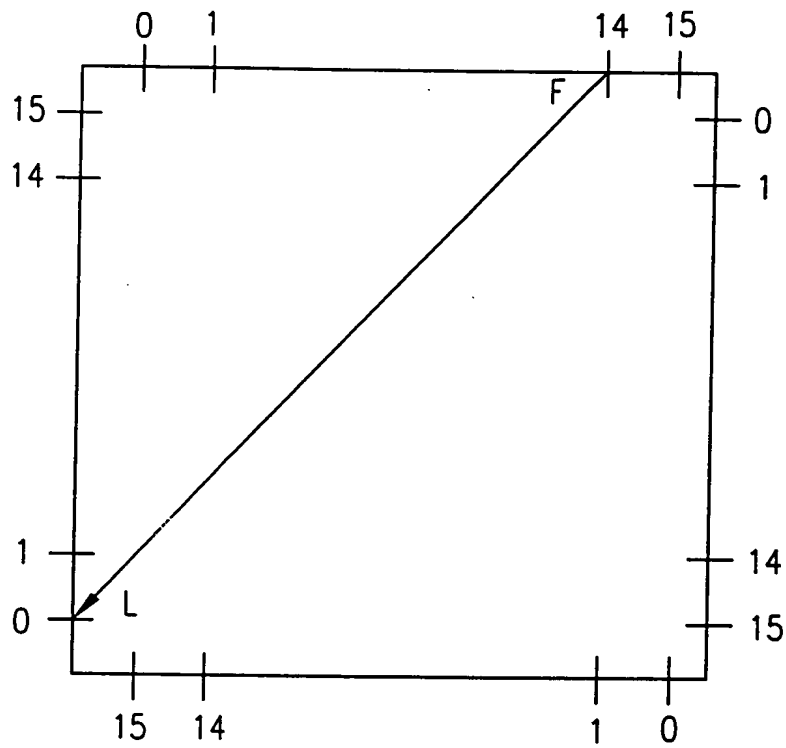


FIG. 24

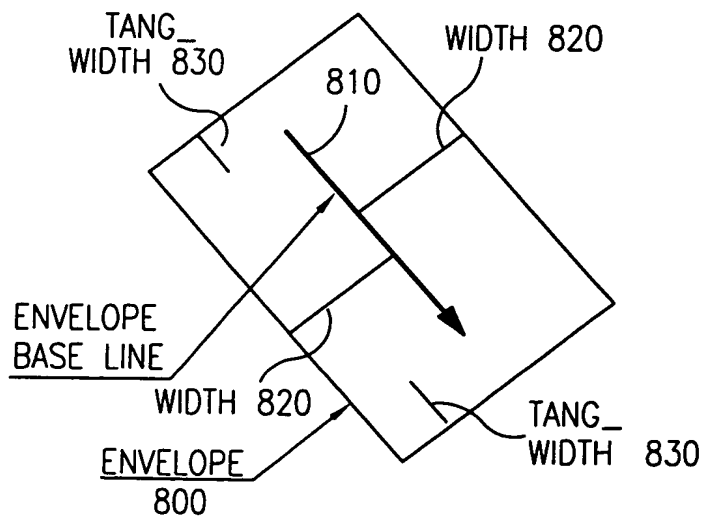


FIG. 25

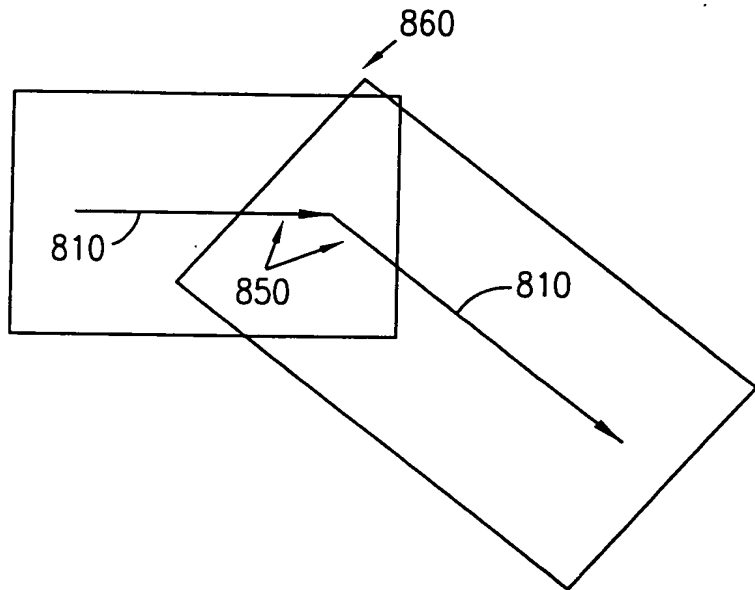


FIG. 26

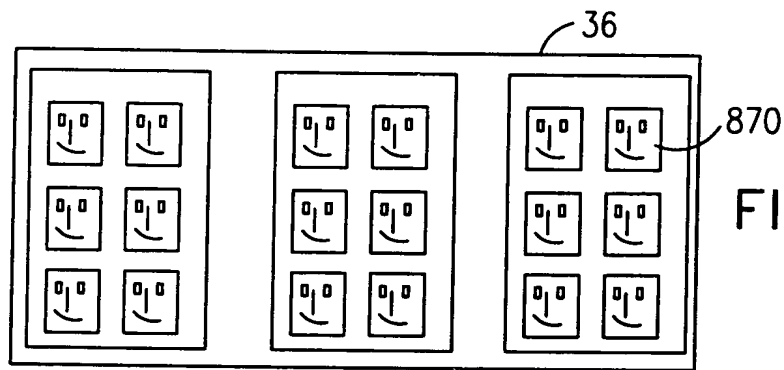


FIG. 27

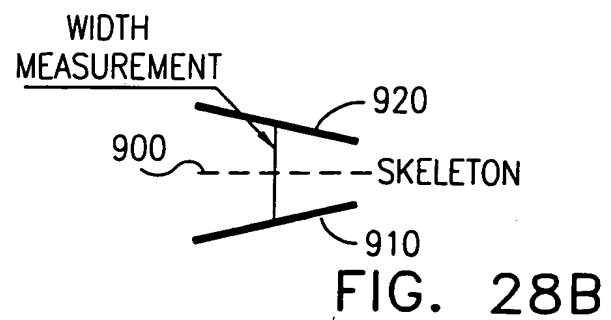
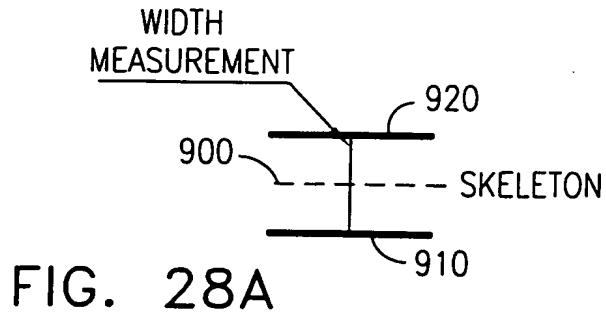
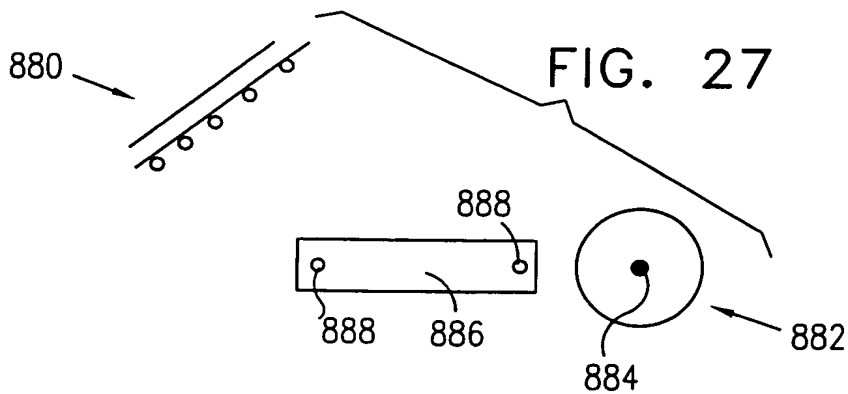
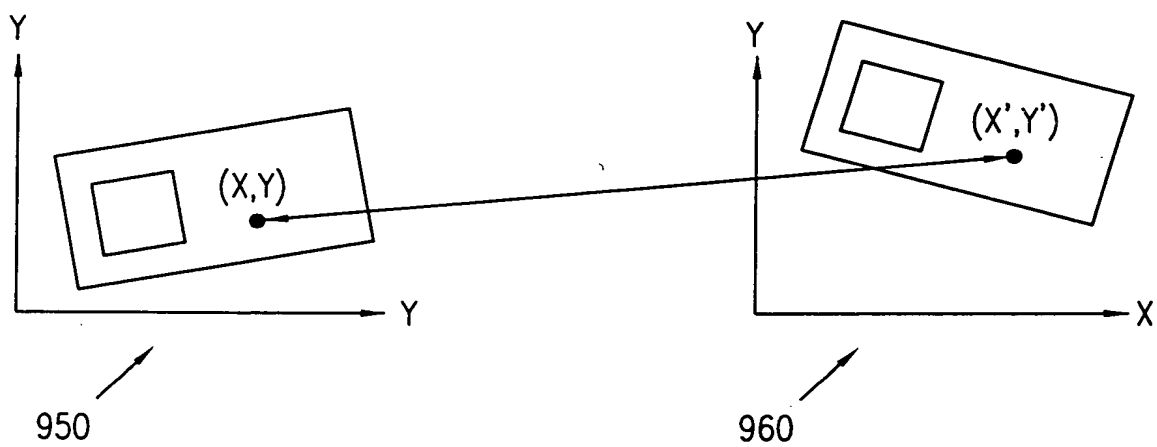


FIG. 29



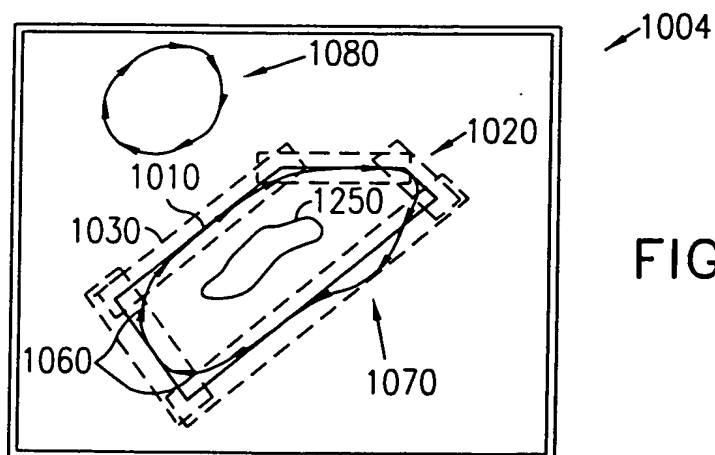
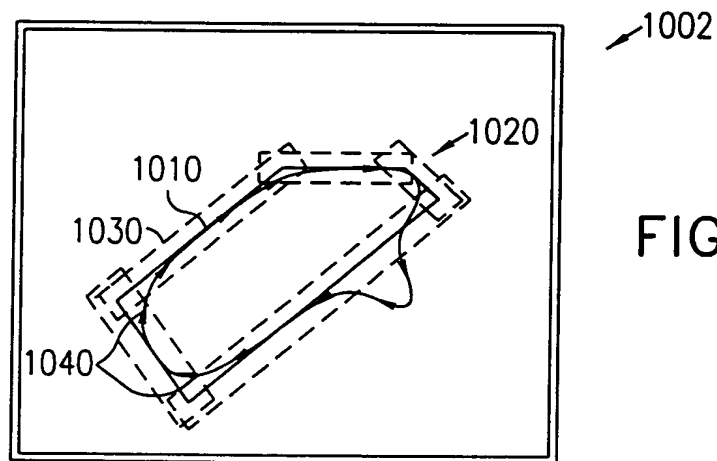
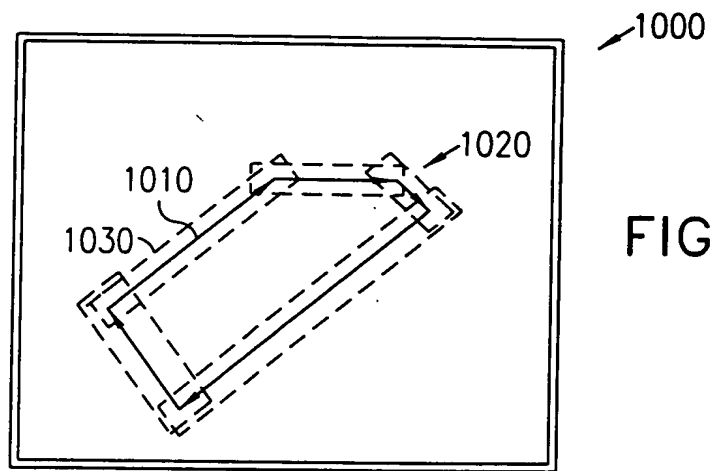


FIG. 31

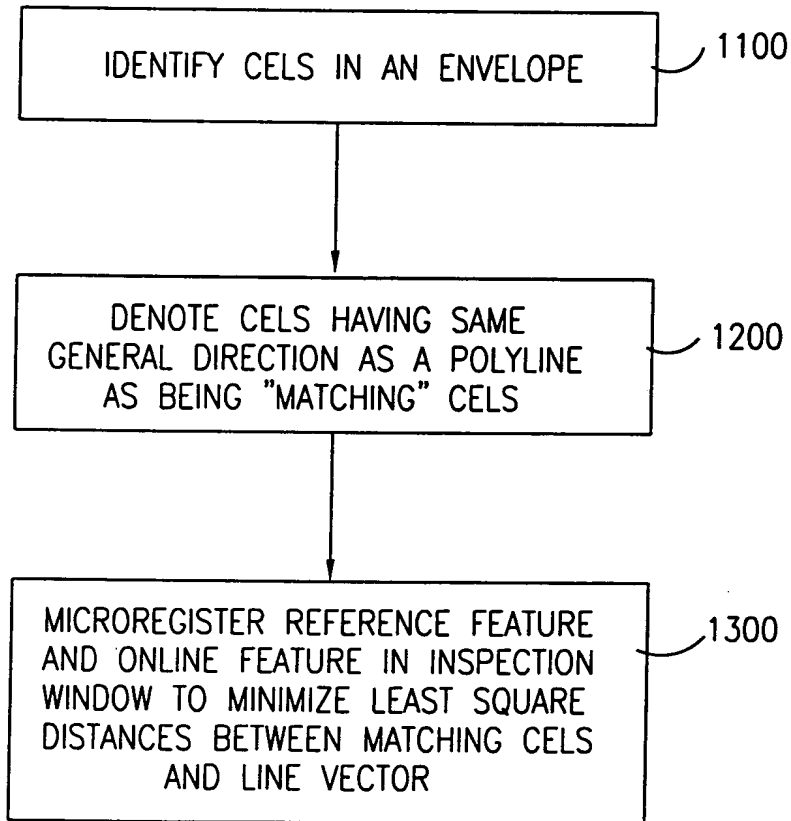


FIG. 32A

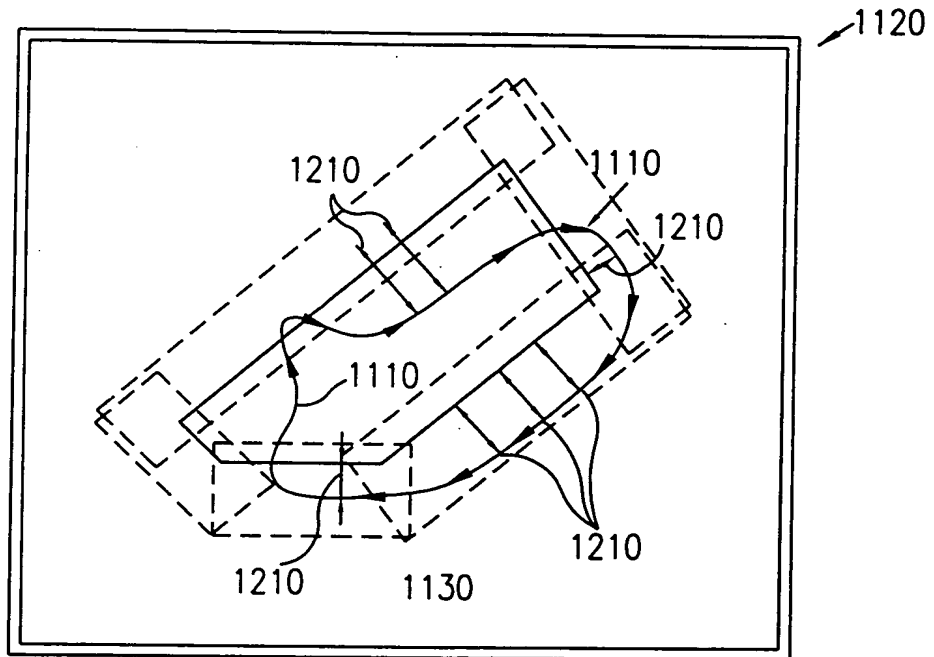


FIG. 32B

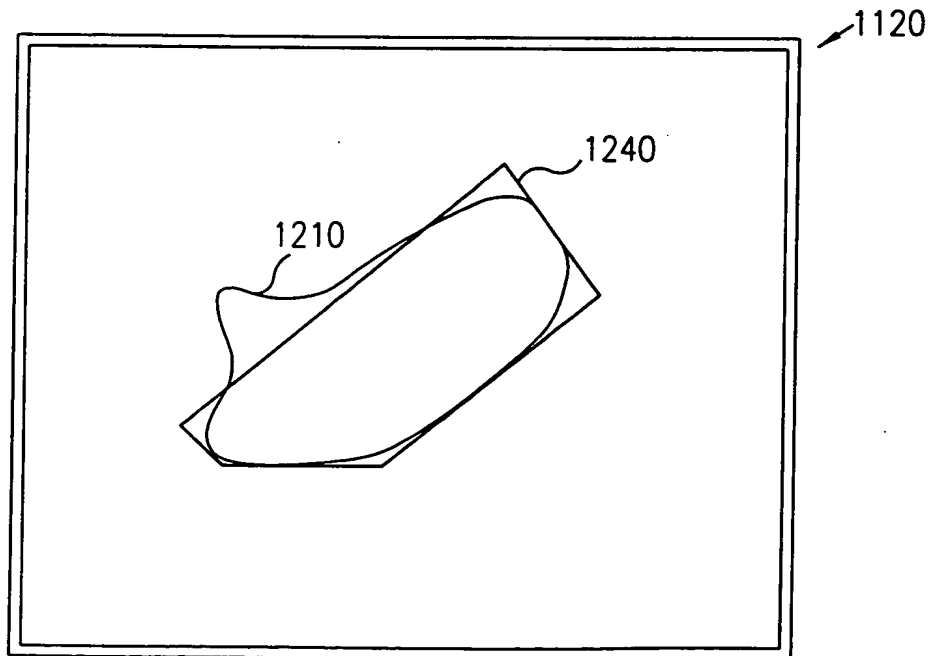
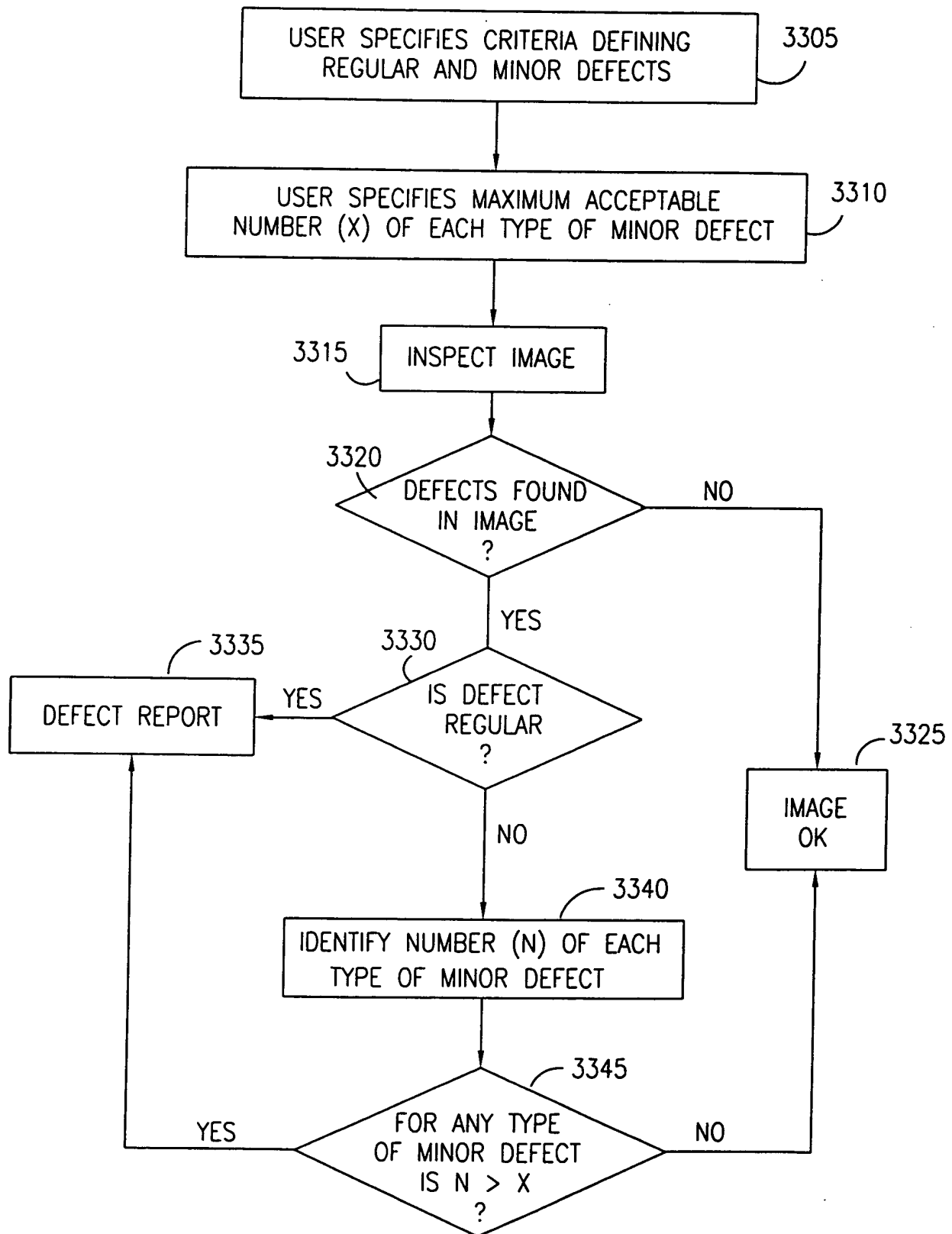


FIG. 33



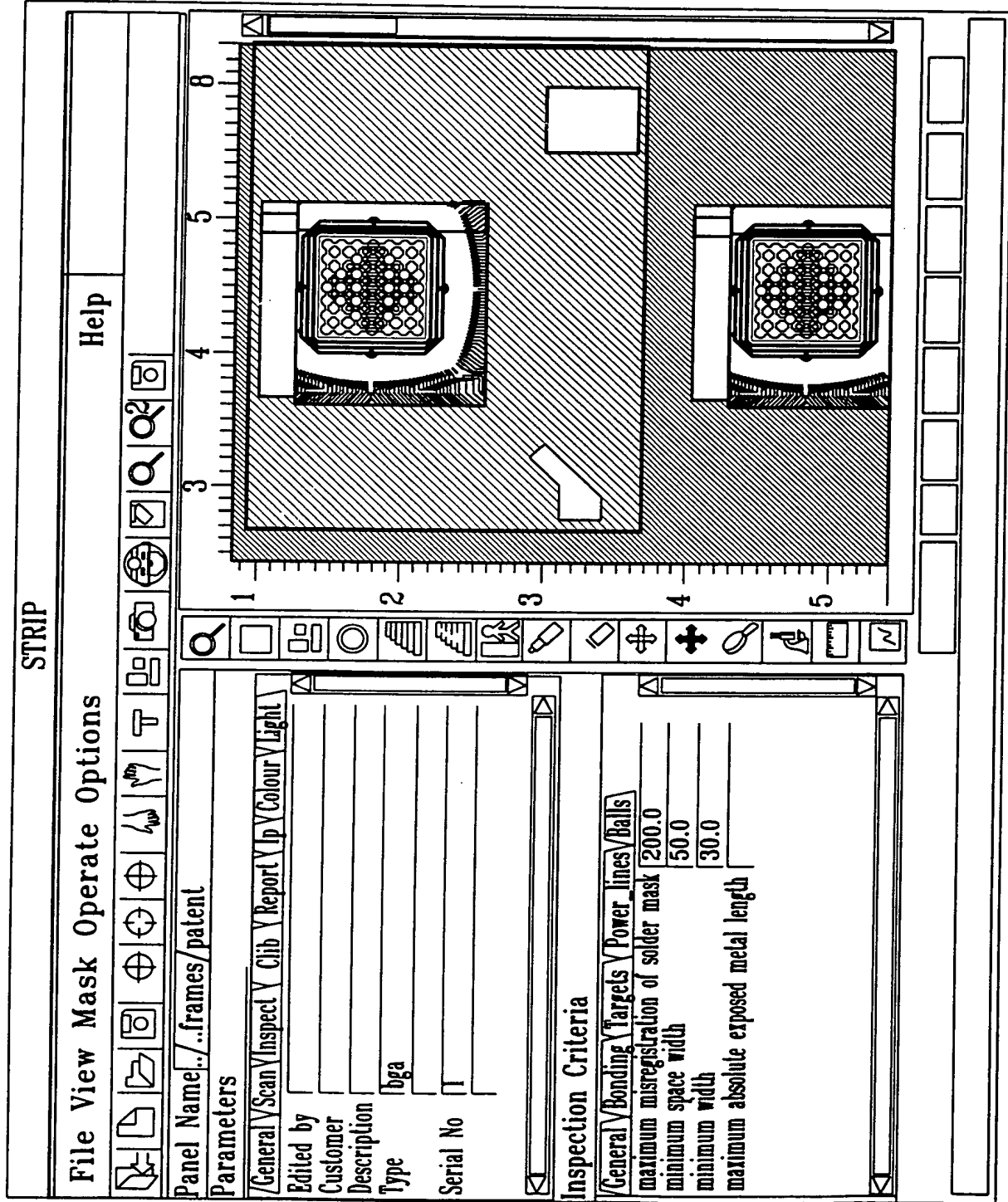


FIG. 34

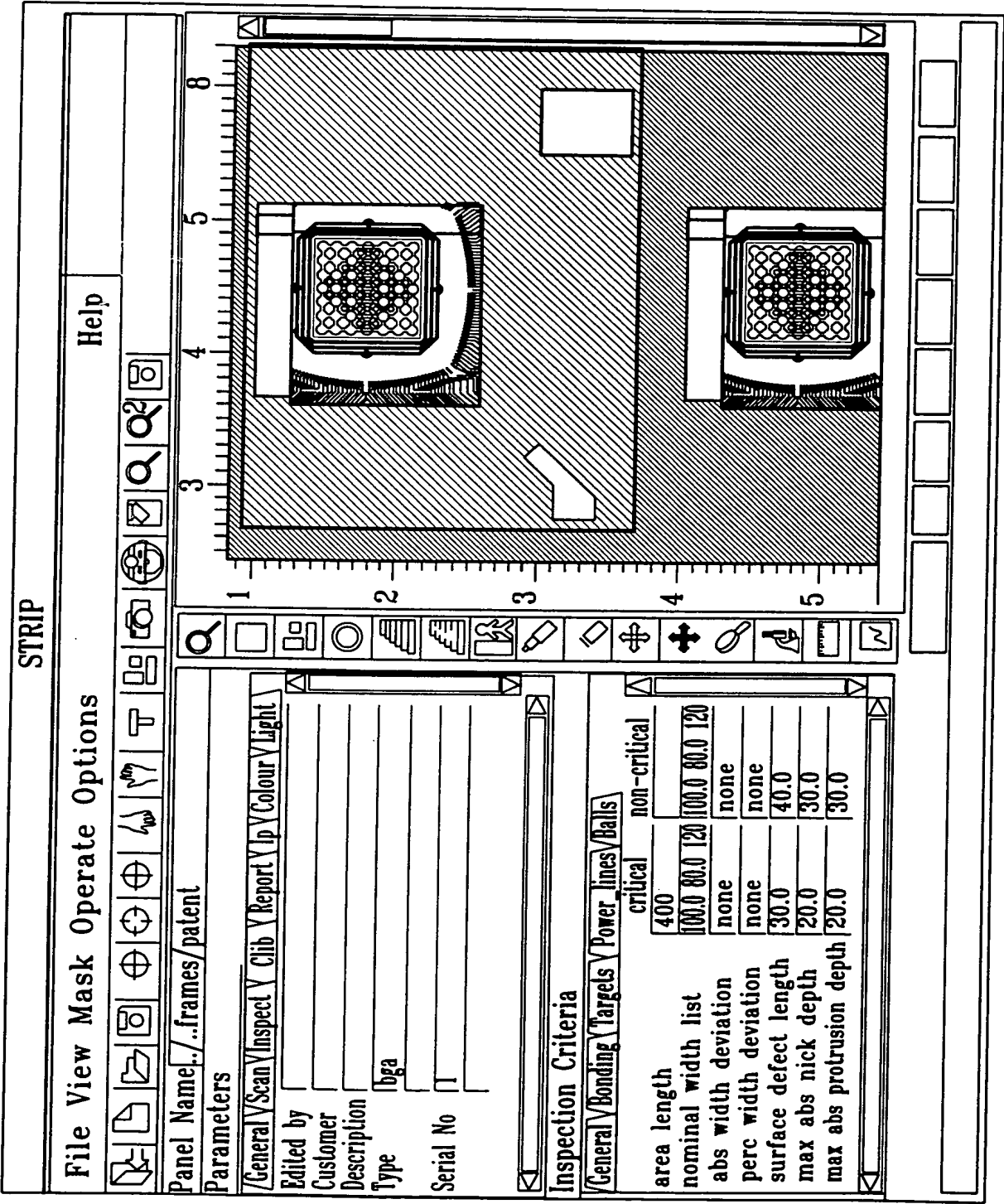


FIG. 35

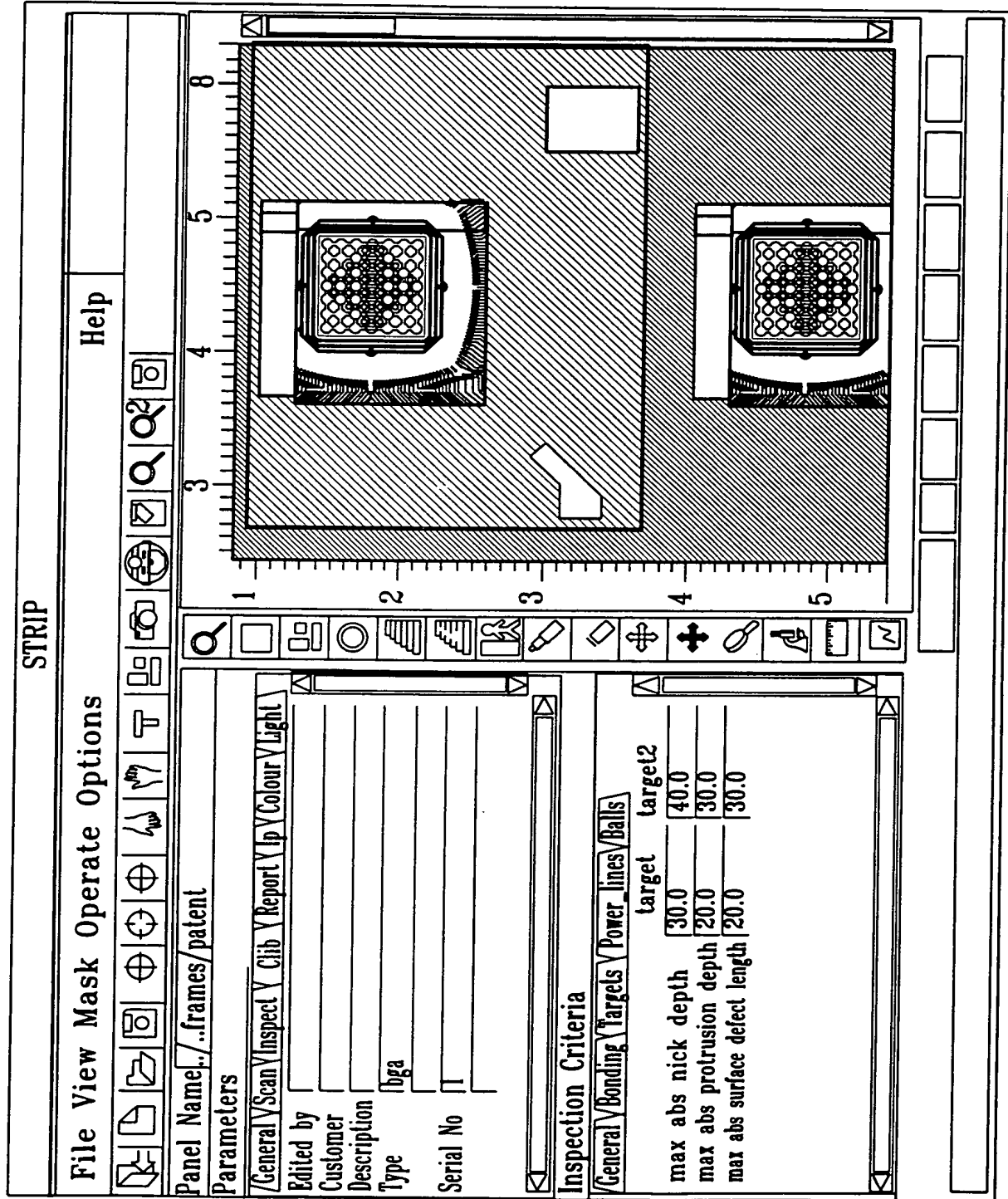
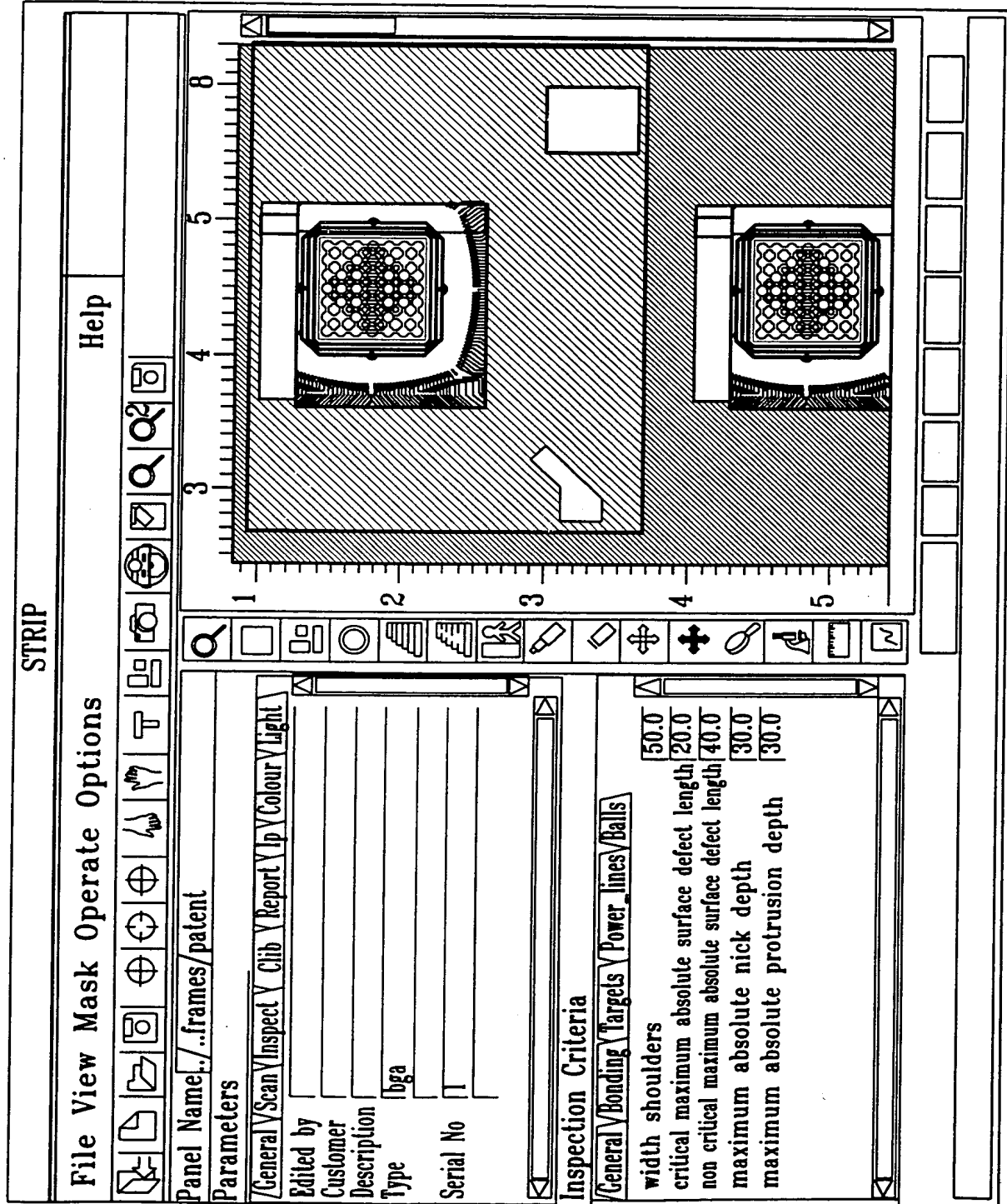


FIG. 36

FIG. 37



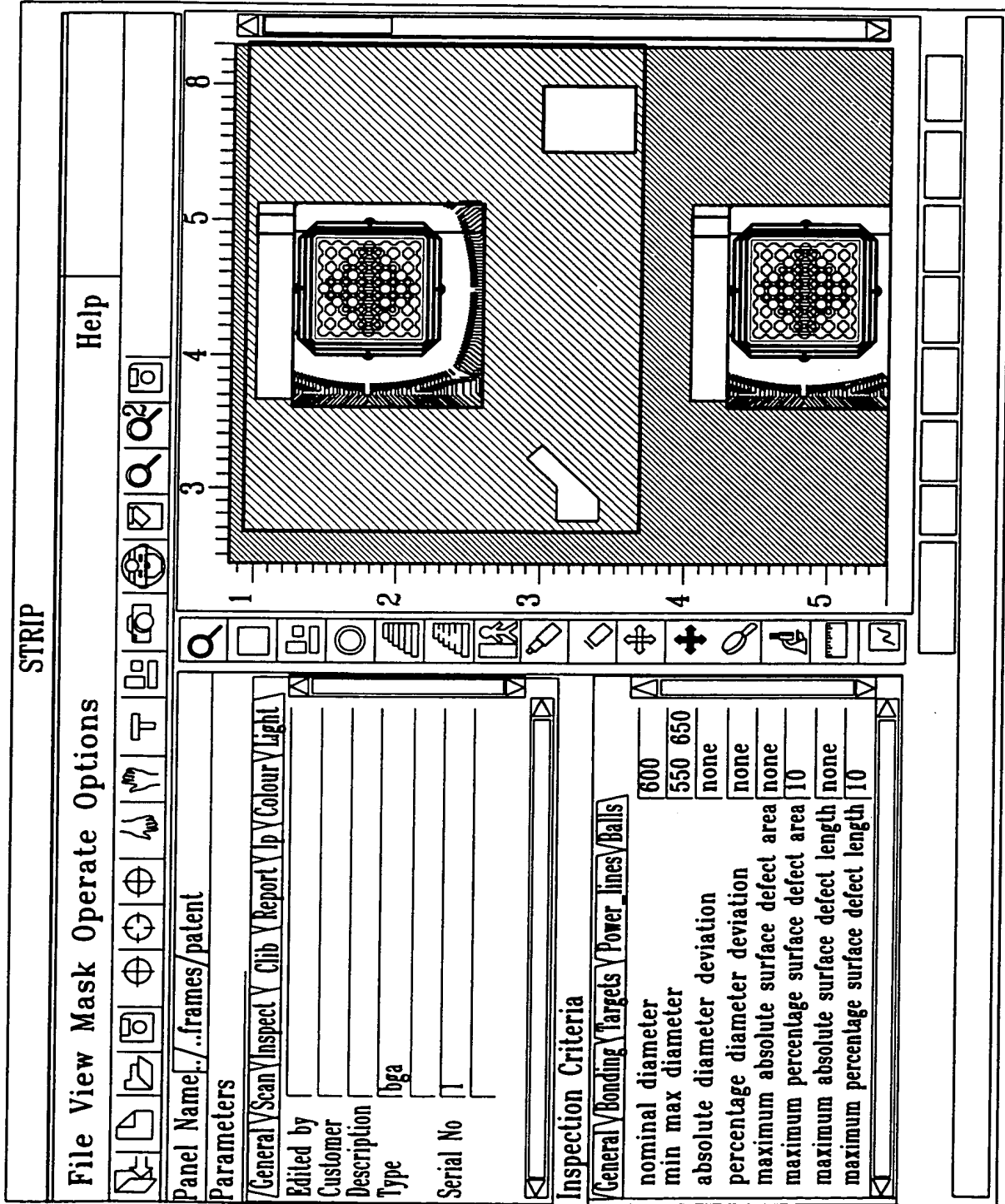


FIG. 38

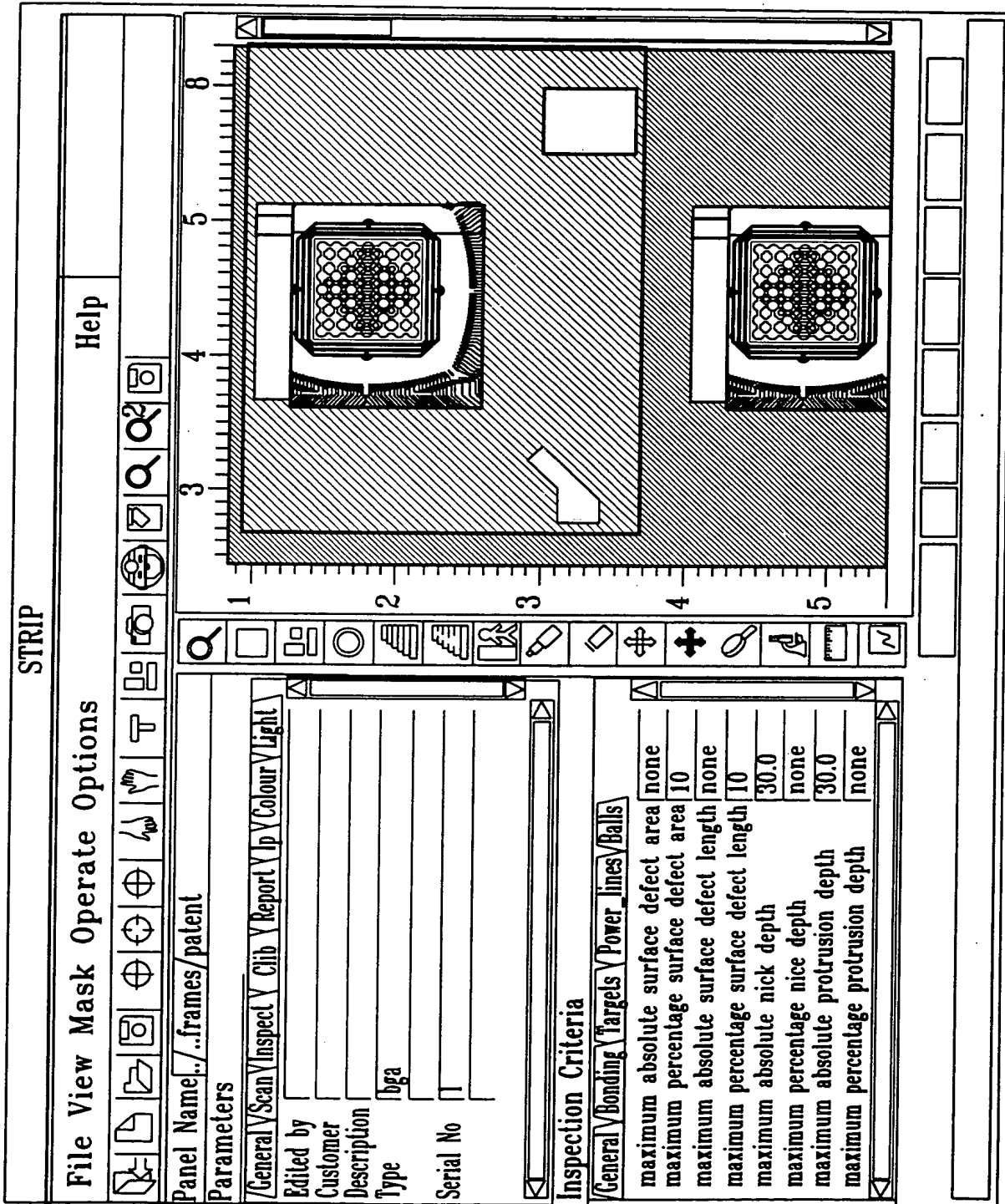


FIG. 39

FIG. 40

expert	
File Operate	
<input type="checkbox"/> Sip <input type="checkbox"/> a2d <input type="checkbox"/> icv <input type="checkbox"/> bin <input type="checkbox"/> cabs <input type="checkbox"/> skfd <input type="checkbox"/> sdd <input type="checkbox"/> csd <input type="checkbox"/> cseg <input type="checkbox"/> cdef <input type="checkbox"/> hips <input type="checkbox"/> stretch <input type="checkbox"/> machine <input type="checkbox"/> barcode <input type="checkbox"/> keyence	
Current_camera_alignment_transform_0	0.967886 0.000111 0.
Current_camera_alignment_transform_1	0.970368 -0.000043 0
Current_camera_alignment_transform_2	0.976427 -0.000074 0
Current_camera_overlaps	{0 147.745} {147.368 314.107} { }
Current_camera_sections	{0 2022} {72 1938} {156 2096}
Learn_camera_alignment_transform_0	1.004721 -0.000014 -0.
Learn_camera_alignment_transform_1	1.001518 0.000049 -0.0
Learn_camera_alignment_transform_2	1.006841 -0.00098 -0.
Learn_camera_overlaps	{0 271.163} {272.03 273.346} {271}
Learn_camera_sections	{0 1960} {135.596 1959} {135}
Repeat_Adjust_X	0.0
Repeat_Adjust_Y	0.0
Repeat_Length	100
Repeat_Repeat_X	1
Repeat_Repeat_Y	1
Repeat_Size_X	100
Repeat_Size_Y	100
Repeat_Width	100
Repeat_X_offset	0.0
Repeat_Y_offset	0.0
balls_adjlust_to_nominal	yes
balls_circle_fit_sensitivity	40.0
balls_maximum_alignment_shift	60.0
balls_maximum_registration_shift	60.0
balls_percentage_circle_fit	60.0
camera_pixels_per_mm	66.667
camera_pixels_size_in_micron	15
camera_width	2096
cel_subpixel_size	16.0
channel_rep_dump	no
channel_red_io_type	File
channel_rep_port_number	6001
channel_sdd_dump	no
<input type="button" value="Apply"/> <input type="button" value="Comradd Config"/>	

FIG. 41

expert

File Operate

Sip a2d icv bin cabs skfd sdd csd cseq cdef hips stretch machine barcode keyence

channel_sdd_dump no

channel_sdd_io_type FILE

channel_sdd_port_number 16002

defect_unifying_distance_mils 8

defect_windows_file /icp/frames/defect_windows

dir_of_defects /tem/panel

dir_of_ref_panel /tmp/panel

dir_of_sip_config /project/icp/dvlp/linux/lib/sip/config

input_rep_file /icp/tmp/panel/dump.cel.intel

input_snap_file /icp/tmp/panel/dump.snp.intel

log_file_of_sip stderr

log_level_channels WARNING

log_level_functions WARNING

log_level_general WARNING

log_level_tasks WARNING

max_registration_tolerance 45.0

multi_process no

output_rep_file /tmp/panel/dump

output_sdd_file /tmp/panel/output.sdd

reg REG DISTANCES IN PIXELS

reg_boot_time_limit 0.5

reg_dynamic_model affine

reg_dynamic_optimal_delta_y 500

reg_dynamic_optimal_points 200

reg_features_noise 4

reg_matcher_table matcher-table.bga

reg_max_panel_rotation 1.0

reg_max_panel_shift 200

reg_max_points_for_boot 200

reg_max_y_for_boot 1500

reg_min_points_for_boot 150

reg_required_accuracy 0.5

reg_unifying_distance 8

Apply Comradd Config

FIG. 42

expert

File Operate

/Sip/a2d/icv/bin/cabs/skfd/sdd/csd/cseq/cdef/hips/stretch/machine/barcode/keyence

log_level_functions WARNING

log_level_general WARNING

log_level_tasks WARNING

max_registration_tolerance 45.0

multi_process no

output_rep_file /tmp/panel/dump

output_sdd_file /tmp/panel/output.sdd

reg REG DISTANCES IN PIXELS

reg_boot_time_limit 0.5

reg_dynamic_model affine

reg_dynamic_optimal_delta_y 500

reg_dynamic_optimal_points 200

reg_features_noise 4

reg_matcher_table matcher-table.bga

reg_max_panel_rotation 1.0

reg_max_panel_shift 200

reg_max_points_for_boot 200

reg_max_y_for_boot 1500

reg_min_points_for_boot 150

reg_required_accuracy 0.5

reg_unifying_distance 8

show_all_em_defects false

show_all_hw_defects false

show_all_lw_defects false

sip_buffer_size 10000000

sip_config_dir /home/malcolm/lcp/Dvlp/alfi/lib/sip/config

sip_dma_buffer_size 10000000

sip_max_line_in_scan 14664

sip_max_number_of_defect_report 1000

type_enable_color_masking yes

type_manual_pads_learning no

type_panel_polarity 1

type_power_lines_area_threshold 500.0

Apply Comradd Config

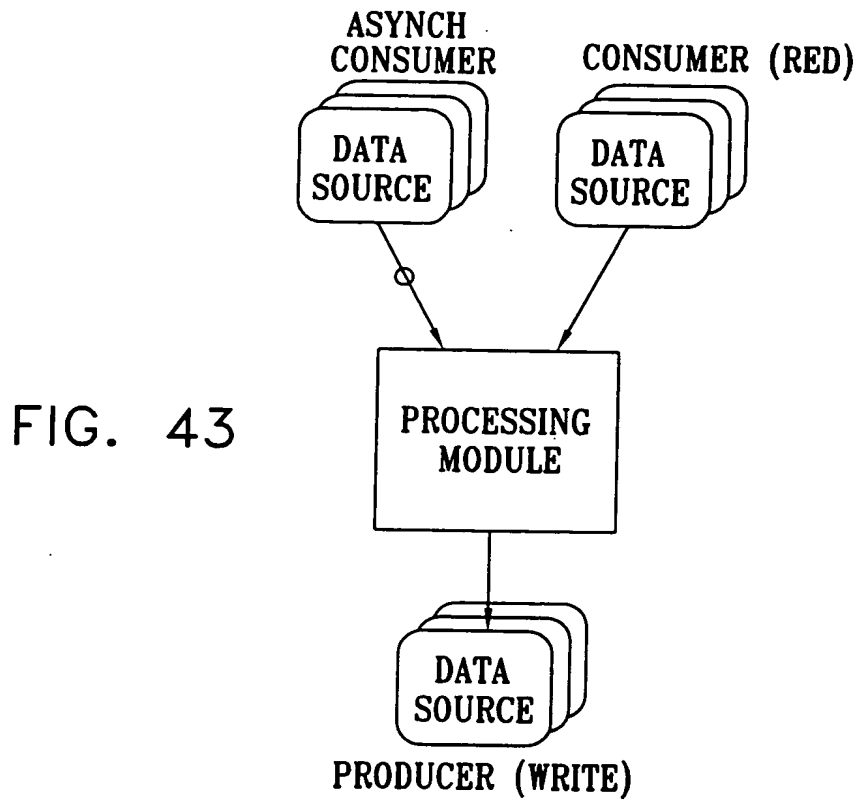


FIG. 44

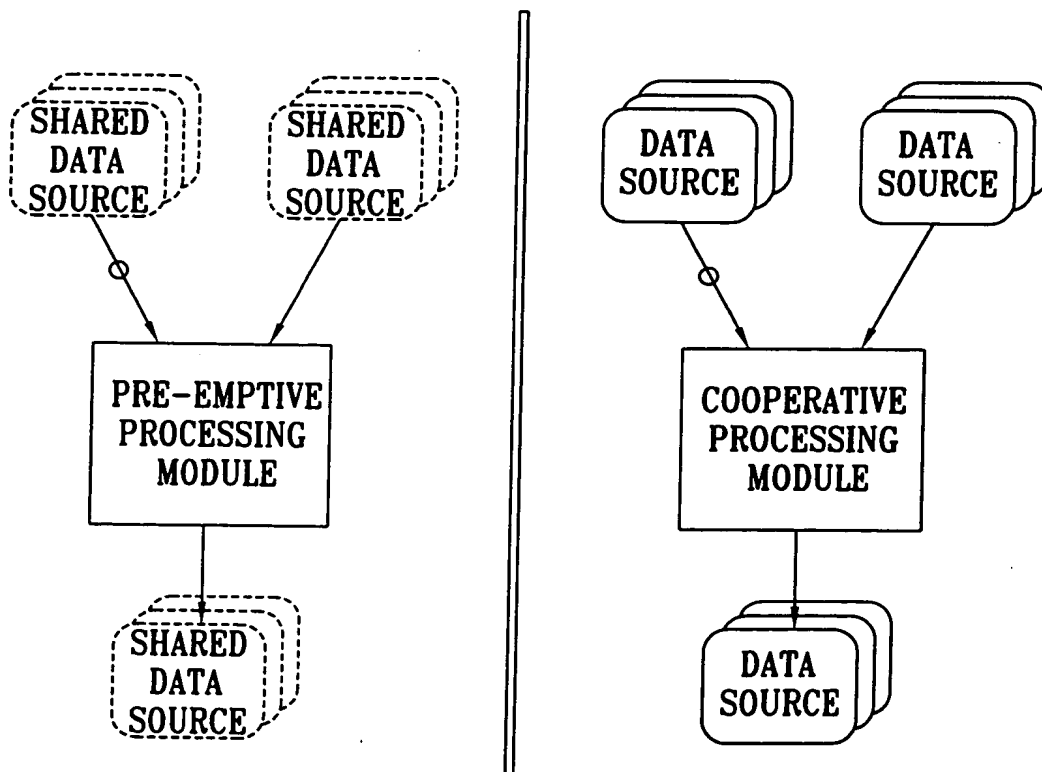


FIG. 45

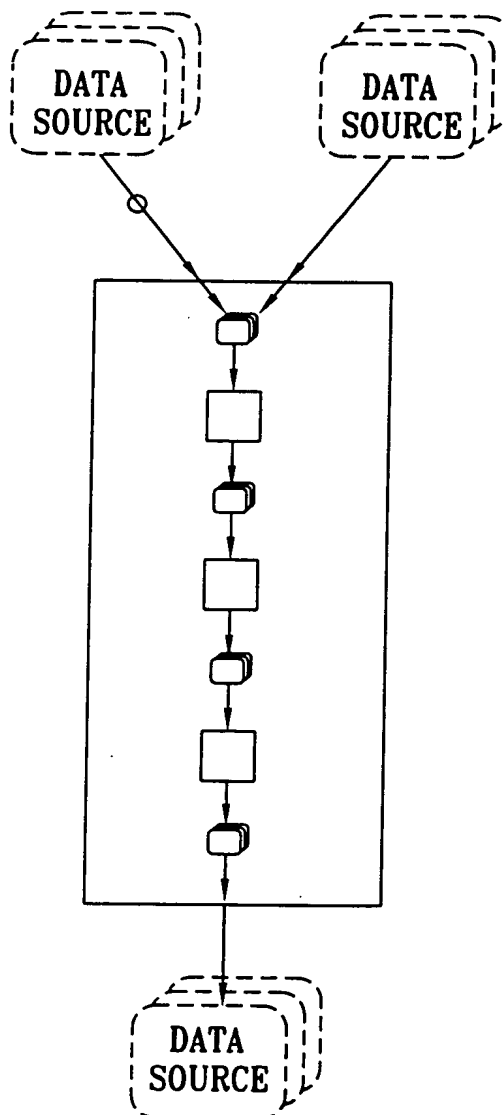
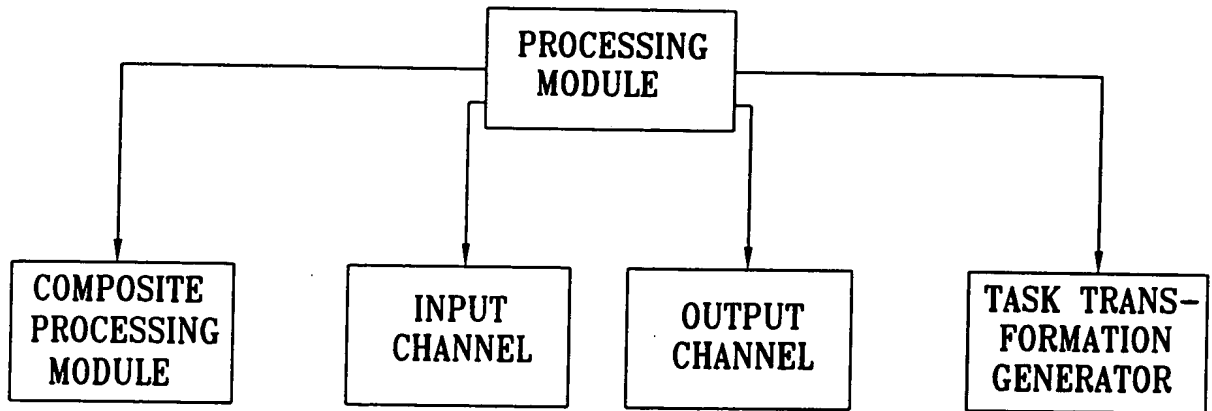


FIG. 46

FIG. 47

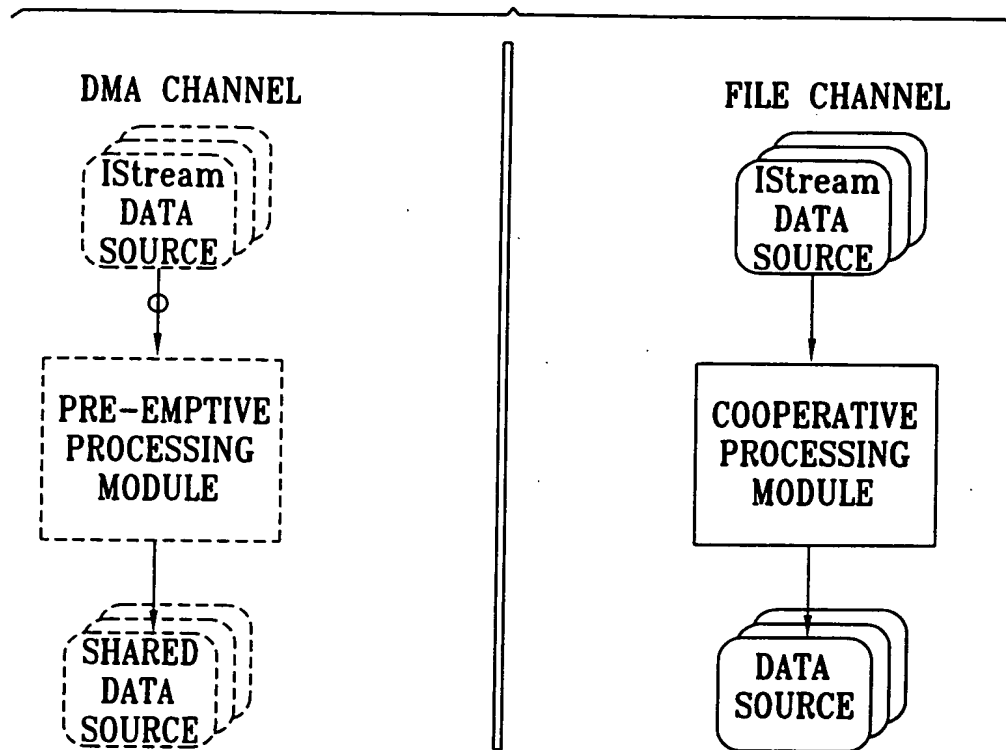


FIG. 48

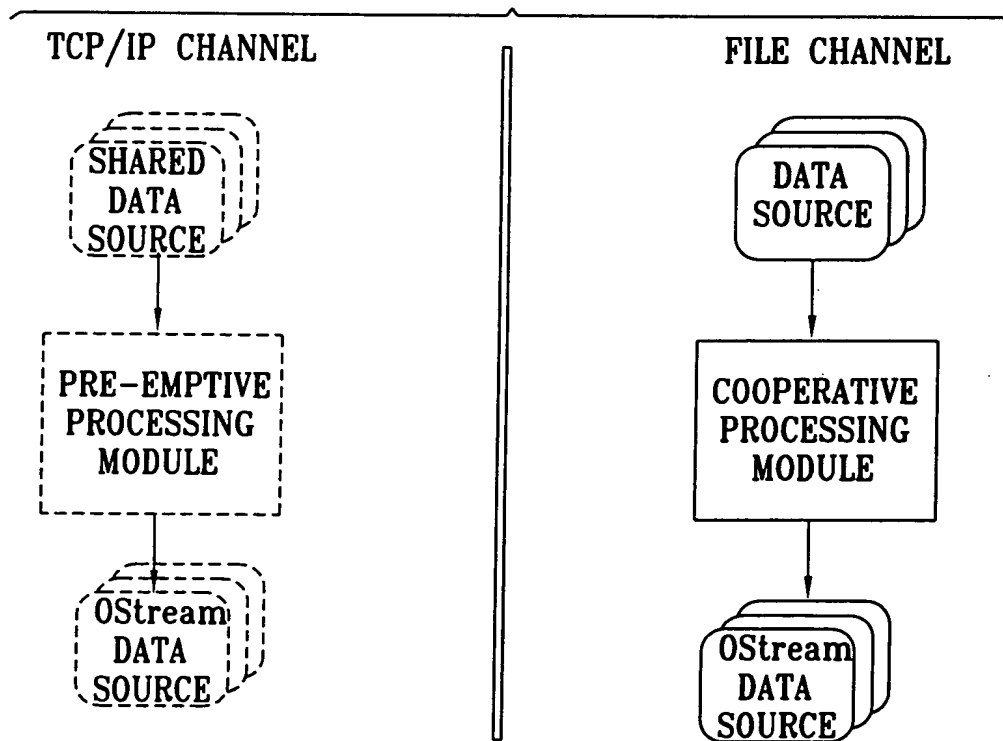


FIG. 49

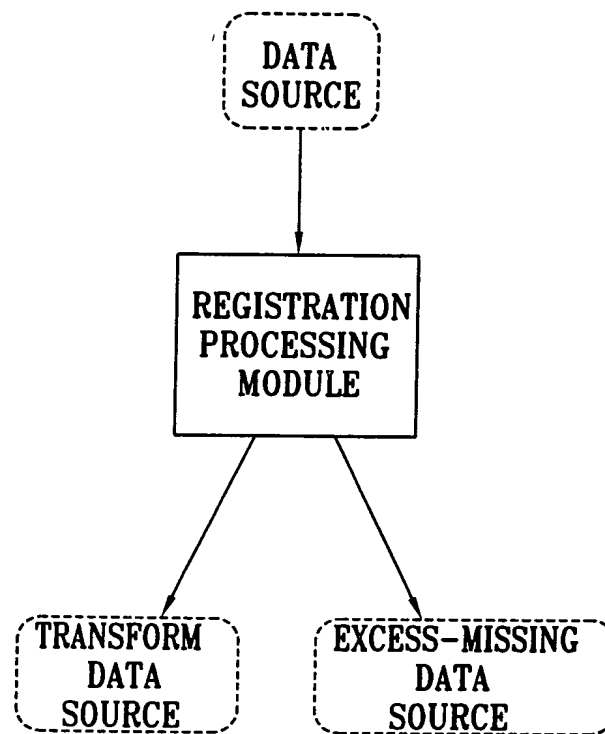


FIG. 50

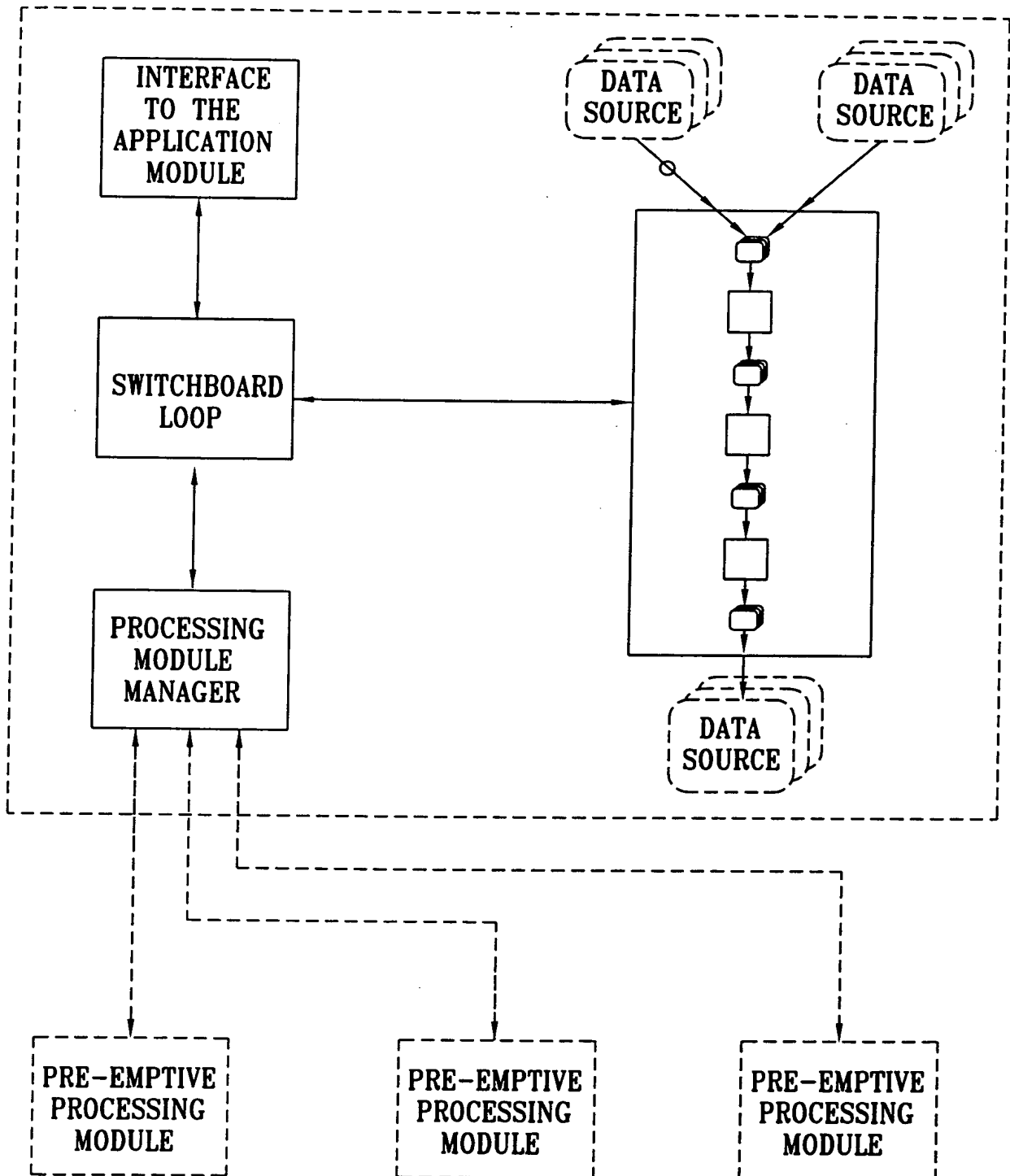


FIG. 51

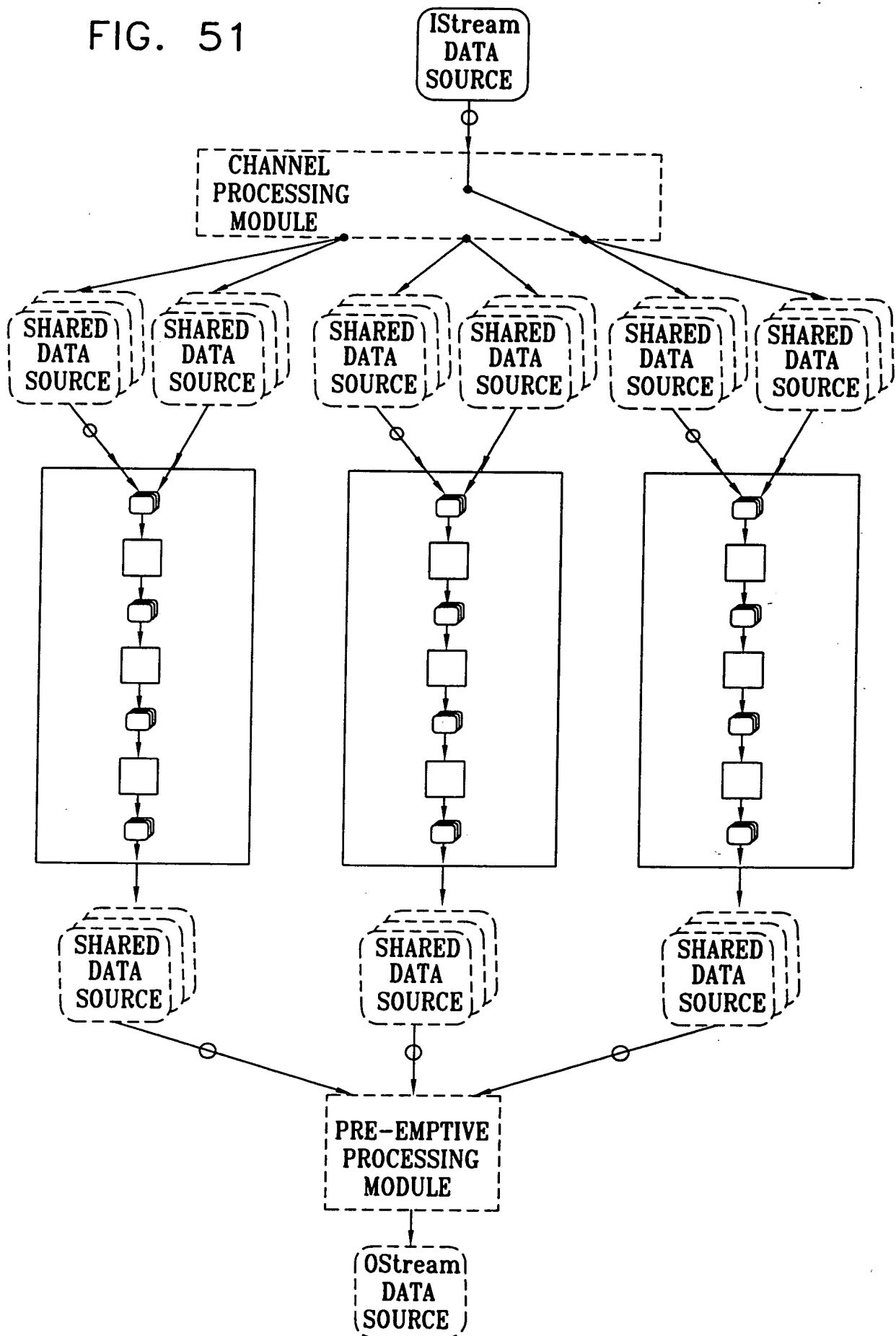


FIG. 52

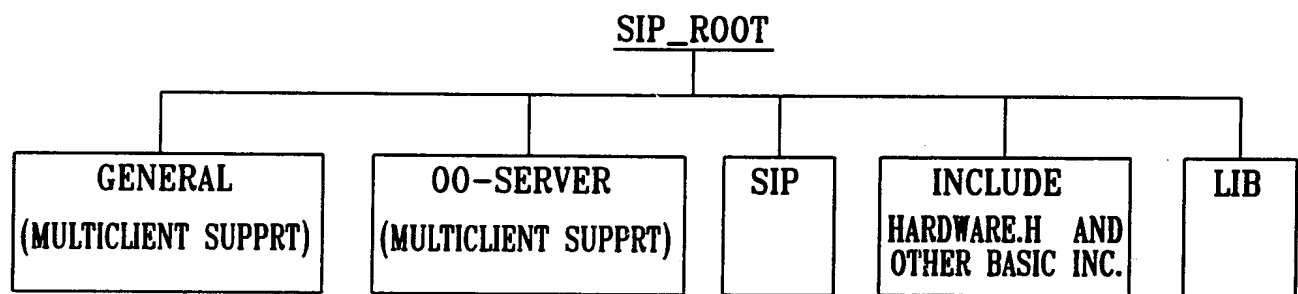


FIG. 53

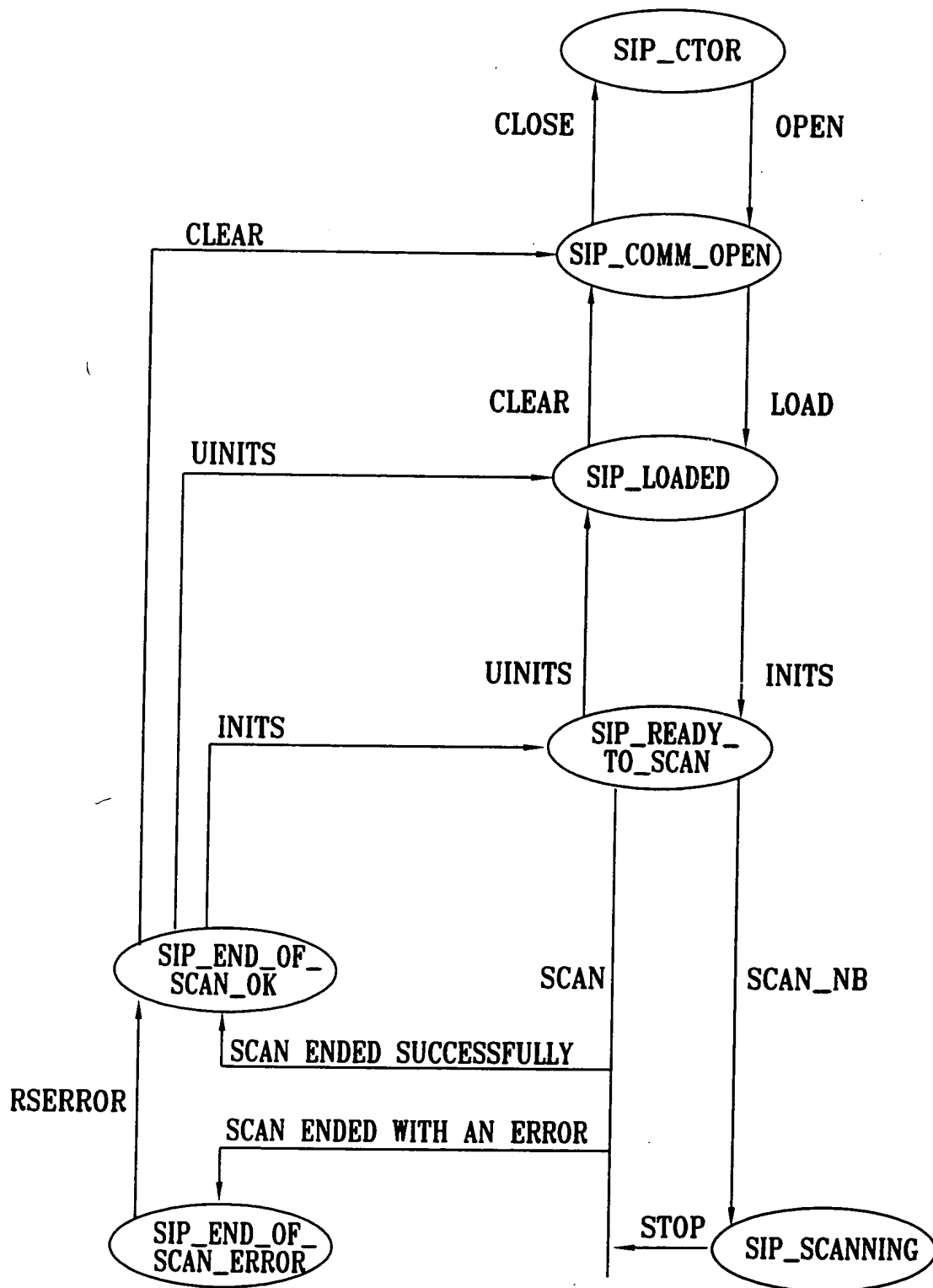
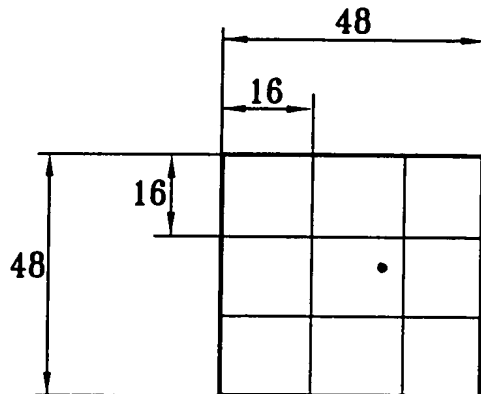
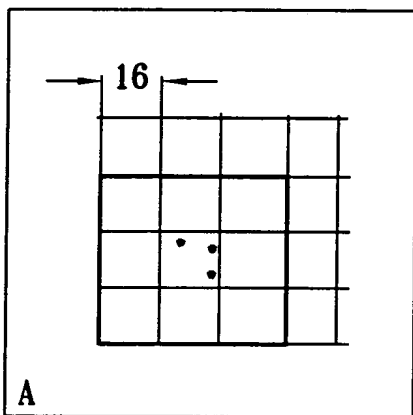


FIG. 54



- DENOTES THE COLOUR DEFECT REPORT DUE TO WHICH THE SNAP OF SIZE 48X48 IS RECORDED.

FIG. 55



- DENOTES A SIGNAL COLOR_DEFECT REPORT

□ DENOTES AREA OF THE SNAP.

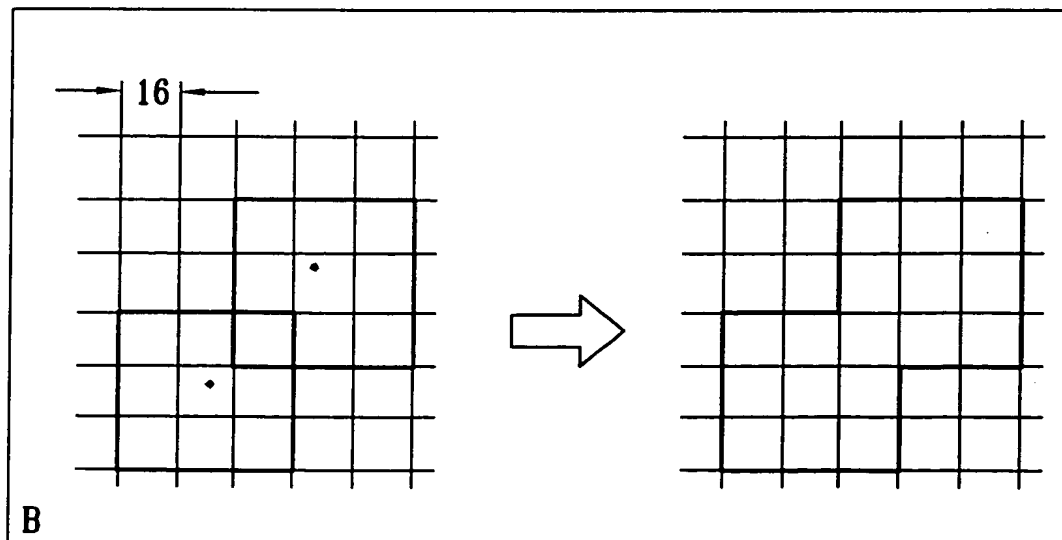


FIG. 56

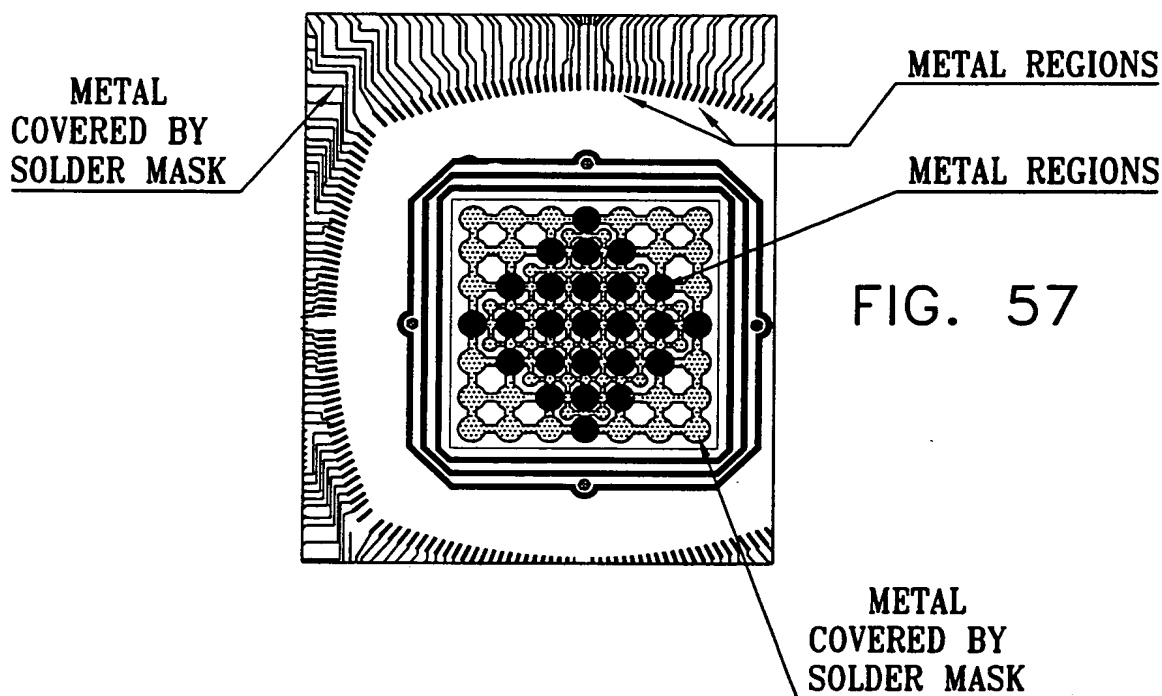
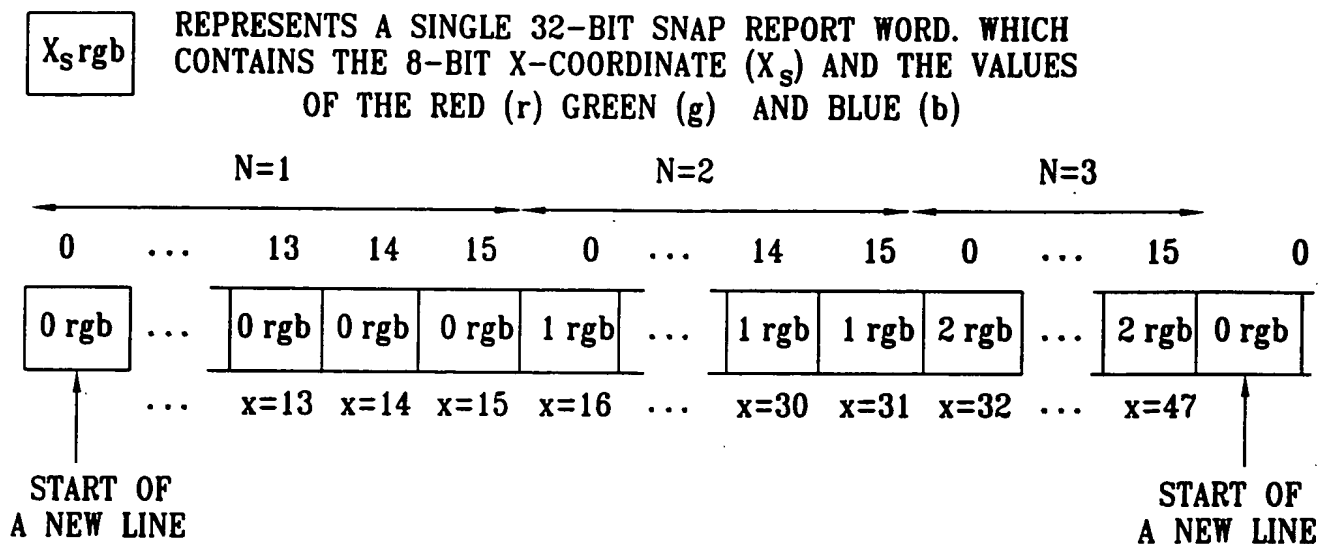


FIG. 58 REGION TO BE IGNORED

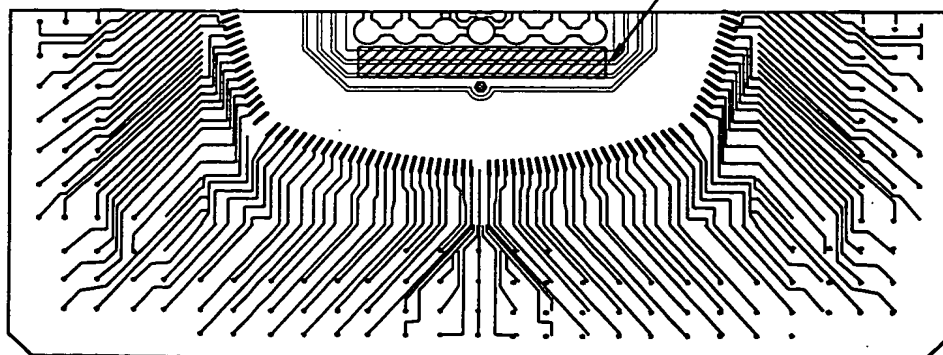


FIG. 59

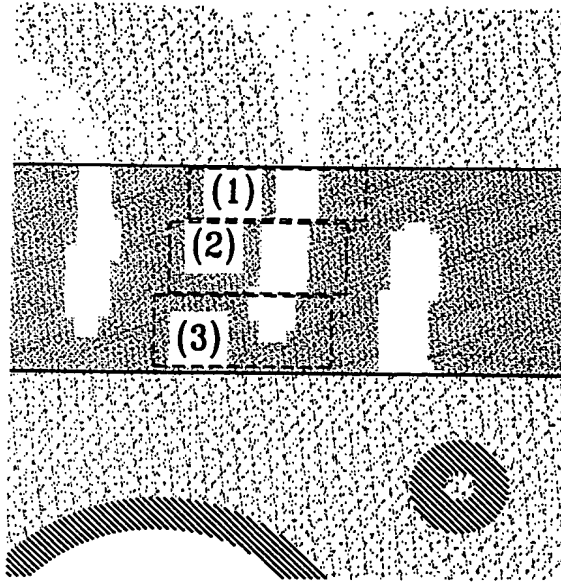


FIG. 60A

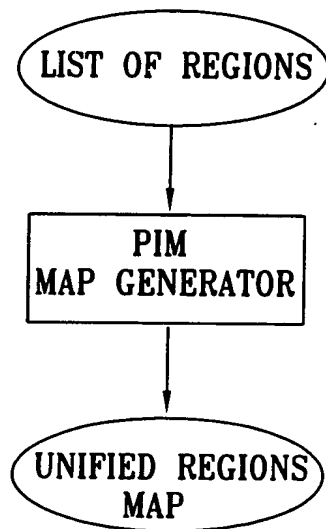


FIG. 60B

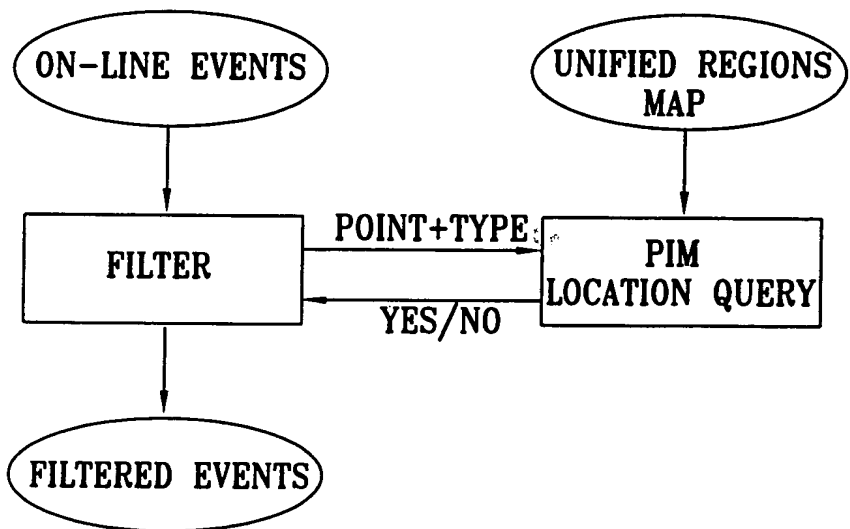
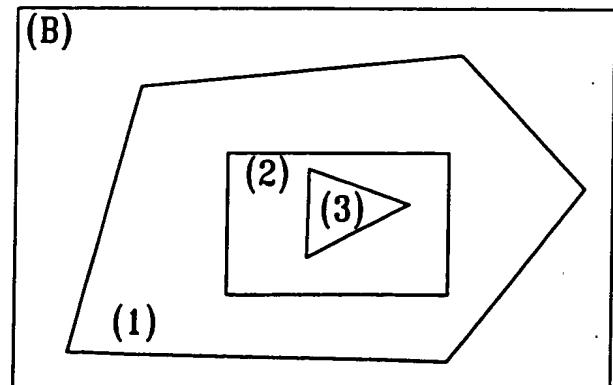
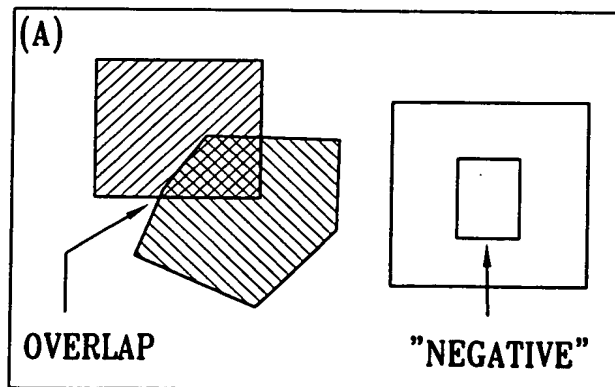


FIG. 61



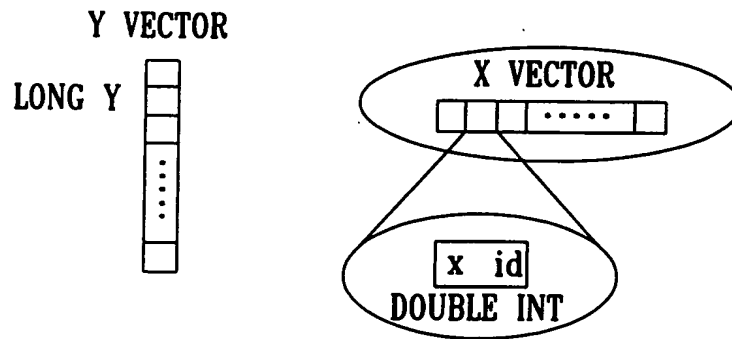


FIG. 62

WHERE THE GRAPHIC INTERPRETATION IS:

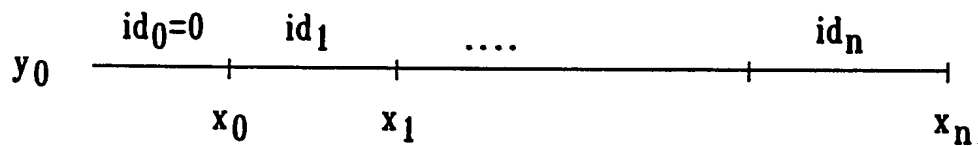


FIG. 63

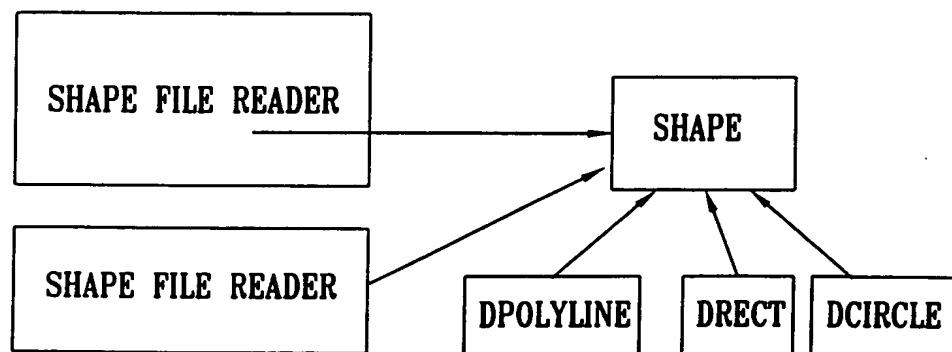
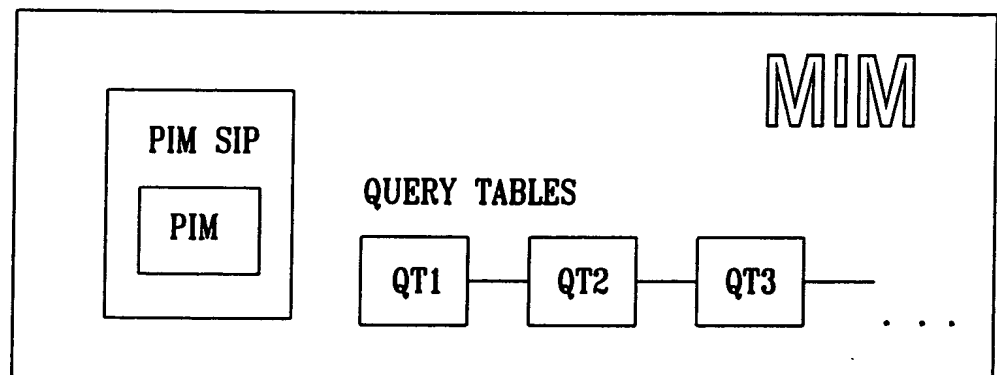


FIG. 64

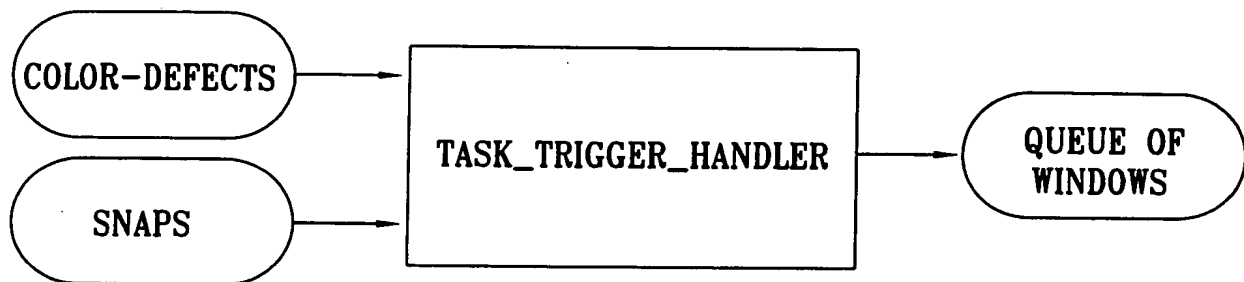


FIG. 65

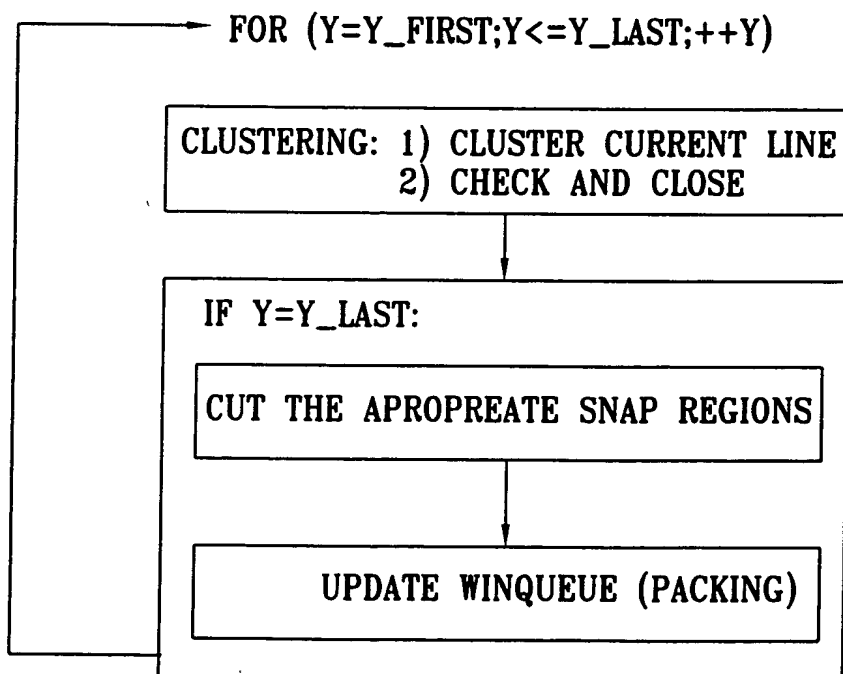
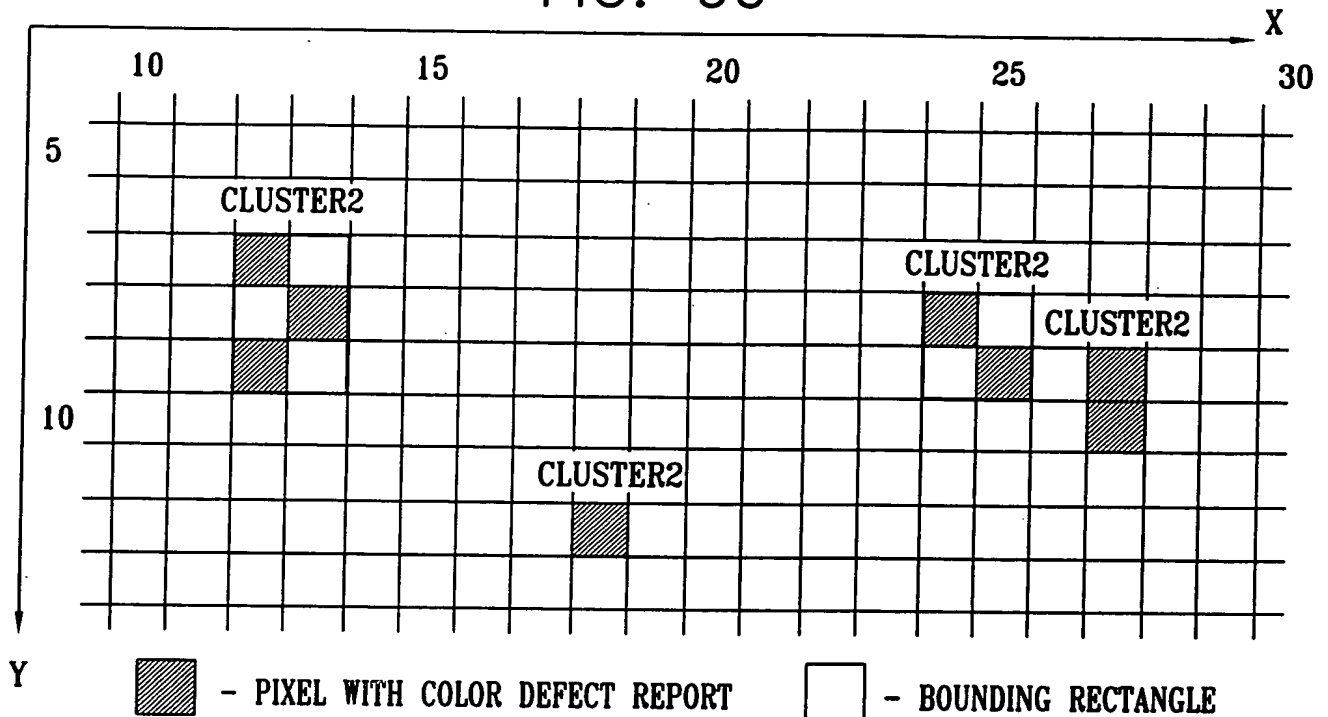


FIG. 66



THE RUN LENGTH STRUCTURE FOR THE CASE WHERE THE SNAP REGION IS THE BOUNDING RECTANGLE ENLARGED BY TWO PIXELS ON EACH SIDE:

Y=5	10'o'1	15'c'1						
Y=6	10'o'1	15'c'1	22'o'2	26'o'2				
Y=7	10'o'1	15'c'1	22'o'2	25'o'3	26'c'2	29'c'3		
Y=8	10'o'1	15'c'1	22'o'2	25'o'3	26'c'2	29'c'3		
Y=9	10'o'1	15'c'1	22'o'2	25'o'3	26'c'2	29'c'3		
Y=10	10'o'1	15'c'1	16'o'4	20'c'4	22'o'2	25'o'3	26'c'2	29'c'3
Y=11	10'o'1	15'c'1	16'o'4	20'c'4	22'o'2	25'o'3	26'c'2	29'c'3
Y=12	16'o'4	20'c'4	25'o'3	29'c'3				
Y=13	16'o'4	20'c'4						
Y=14	16'o'4	20'c'4						
...								

FIG. 67A

THE SNAP RECTANGULAR REGIONS (COLORED AREAS)
THAT WERE CUT ACCORDING TO THE CLUSTERS

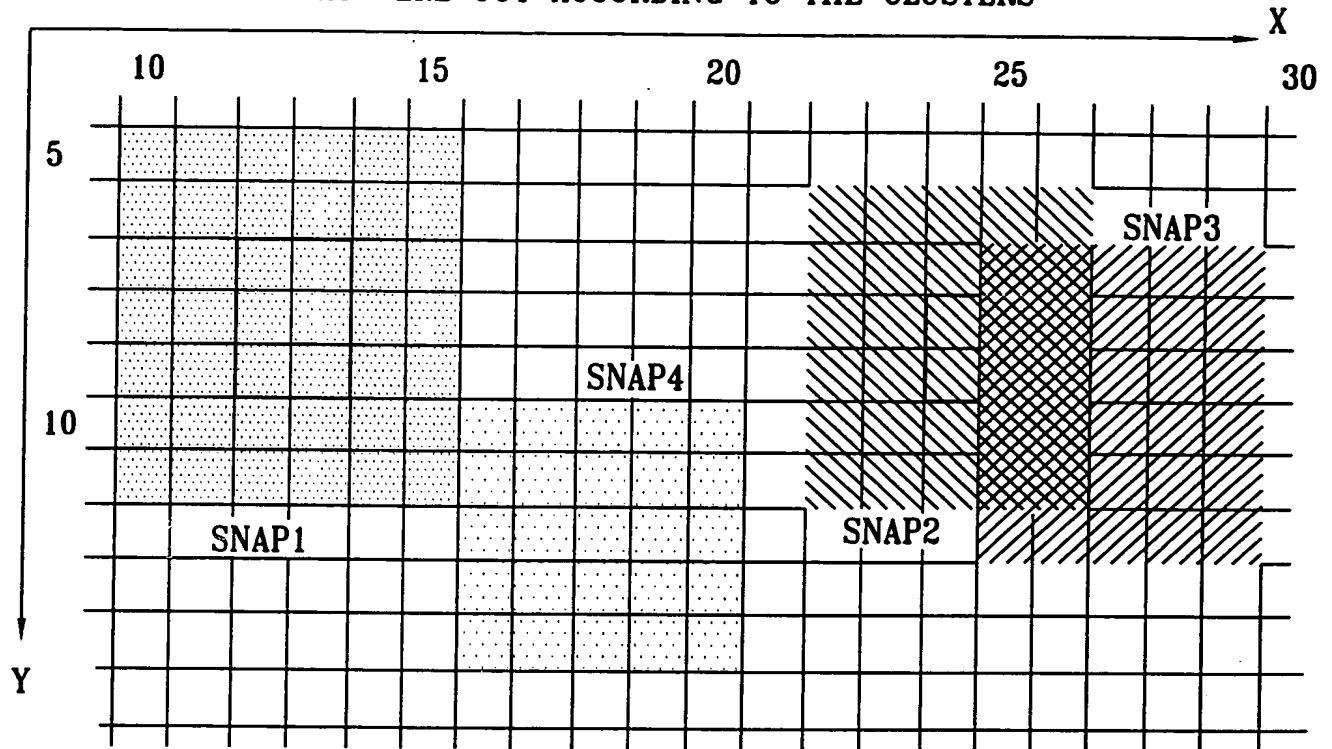


FIG. 67B

THE RESULT IS 4 WINDOWS, EACH POSSESS THE CLUSTER
AND A RECTANGLE WITH THE RED-DATA.

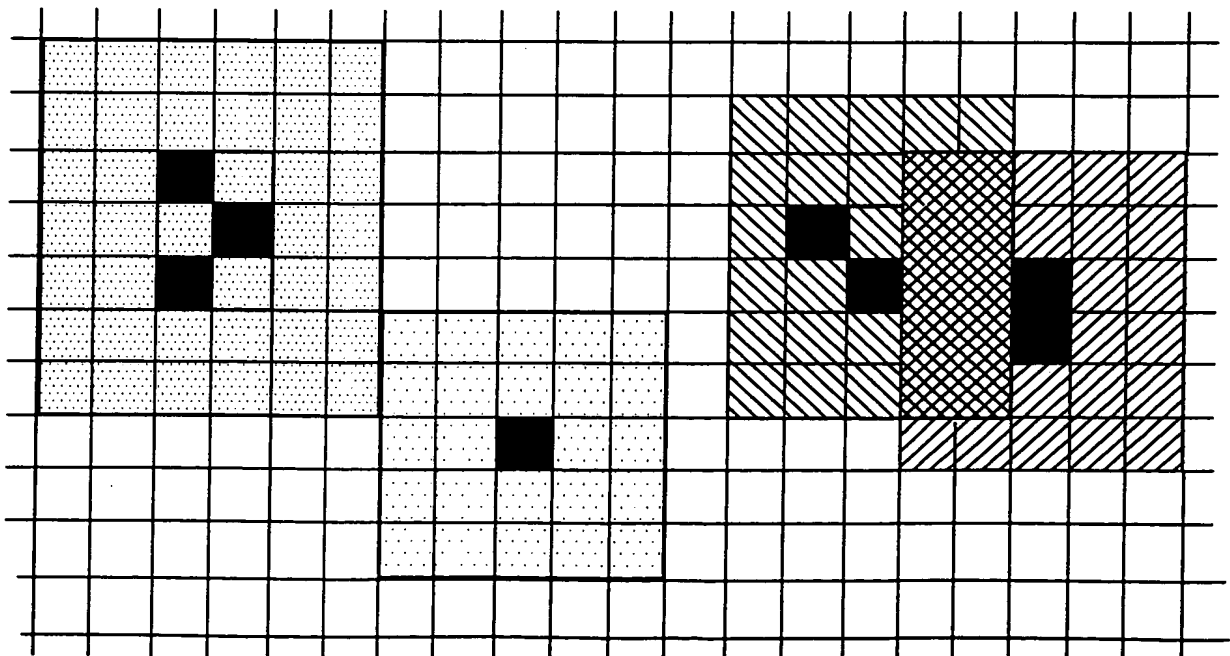


FIG. 68

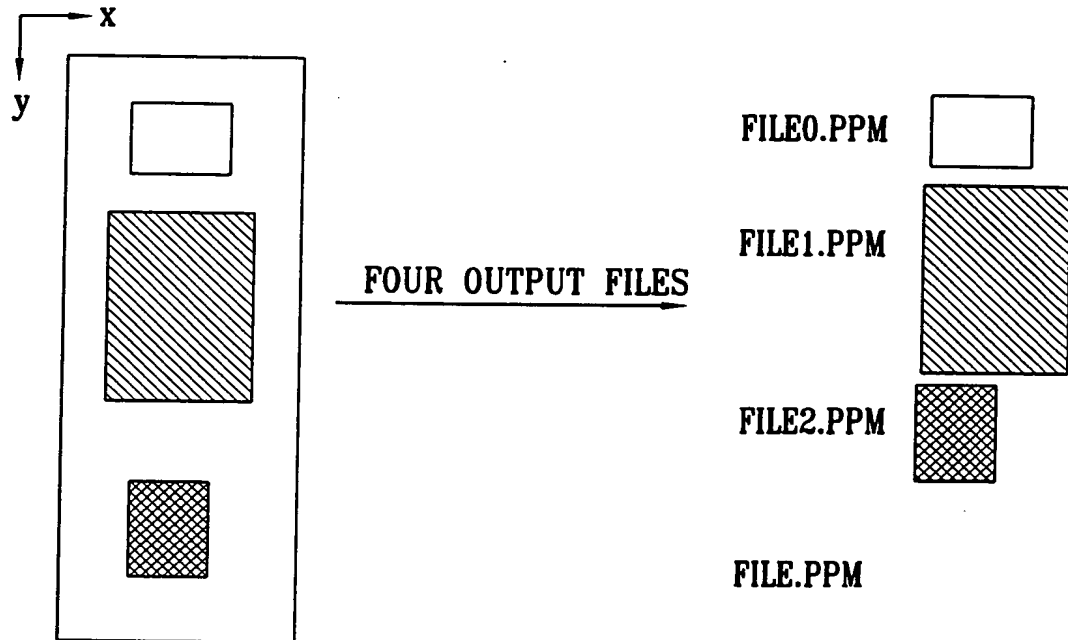


FIG. 69

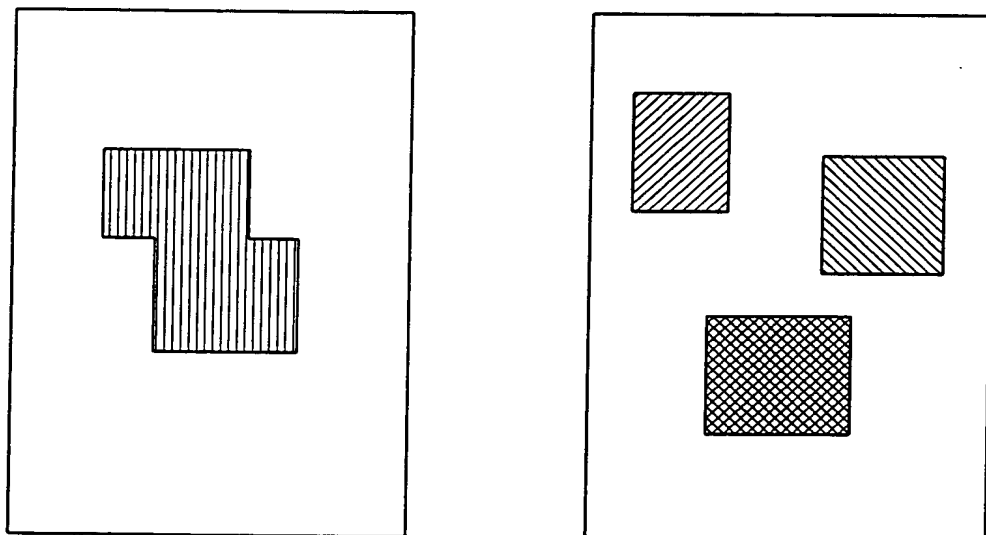


FIG. 70

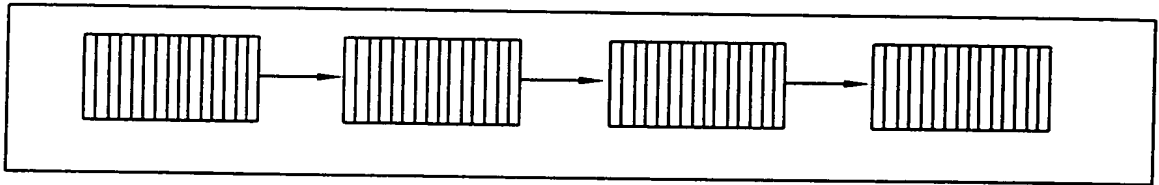


FIG. 71

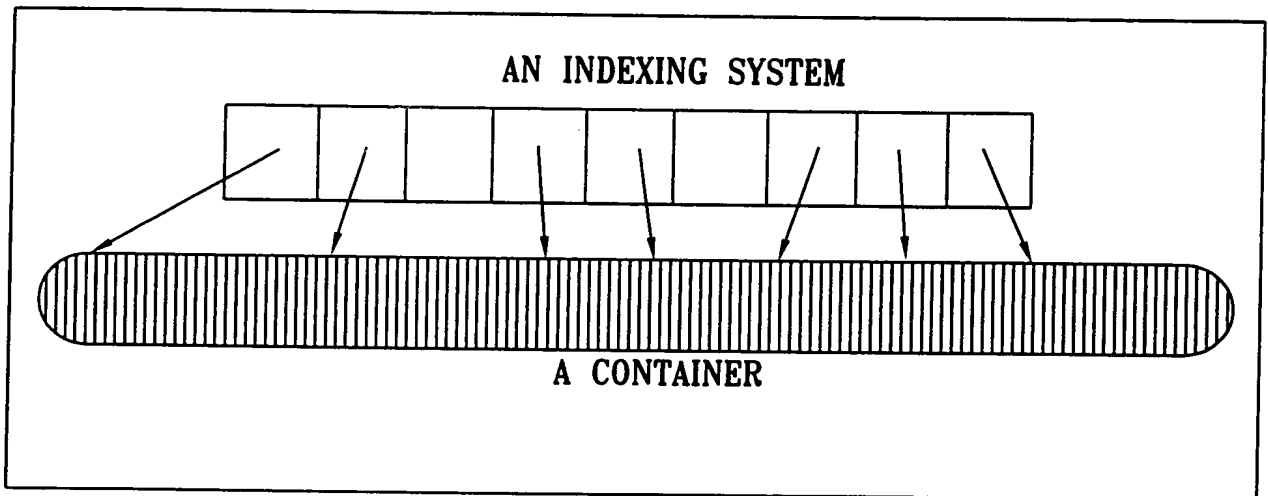


FIG. 72

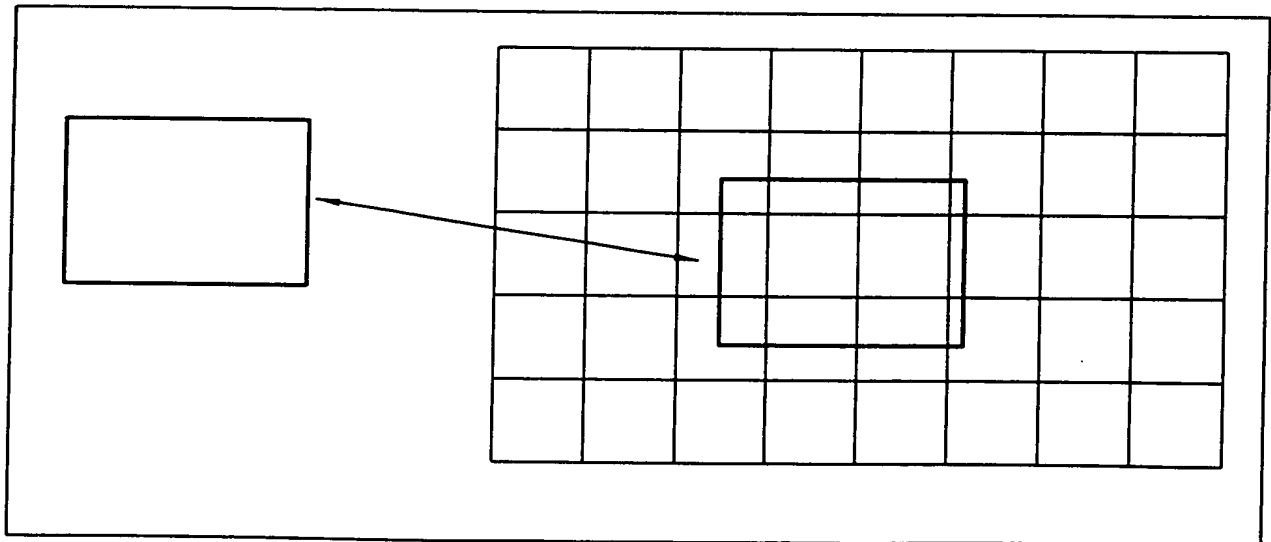


FIG. 73

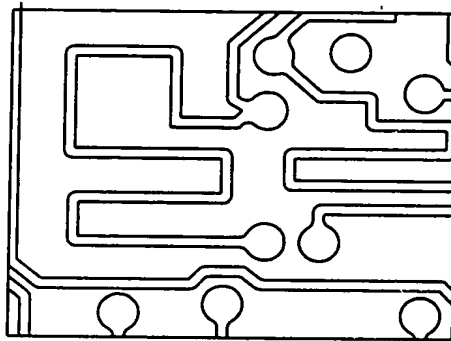


FIG. 74

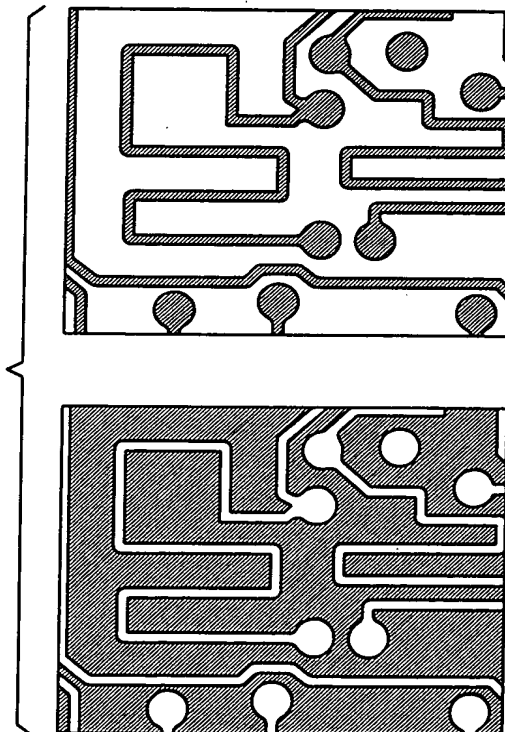
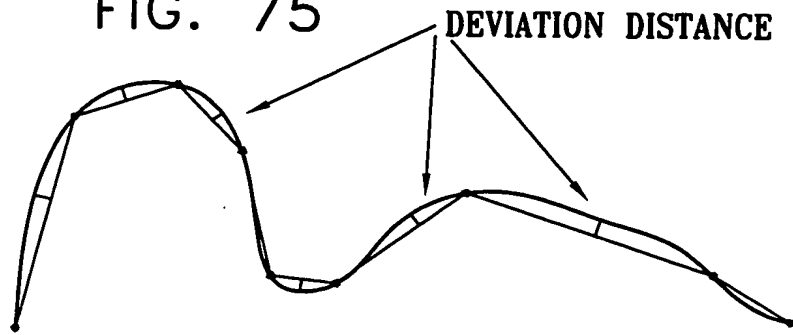


FIG. 75



LOW FREQUENCY
DEFLECTION

FIG. 76

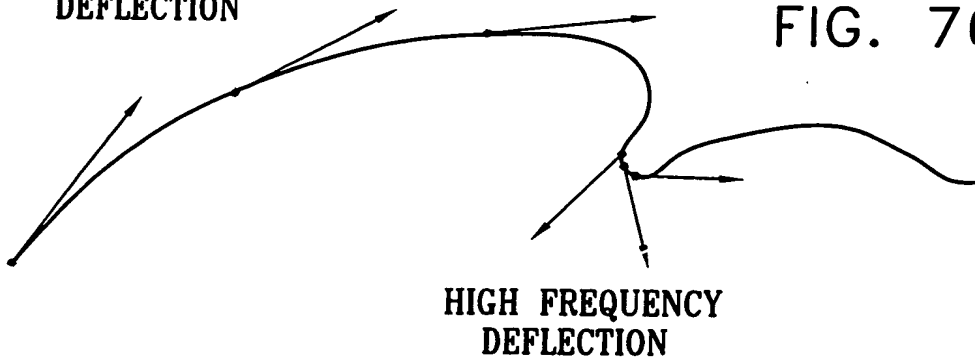
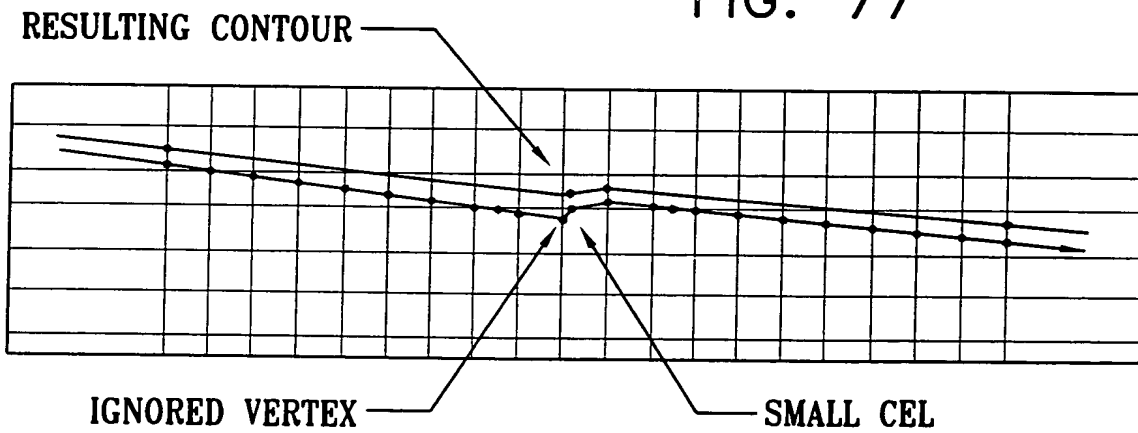


FIG. 77



MAXIMUM DISTANCE
FROM ORIGINAL CONTOUR

FIG. 78

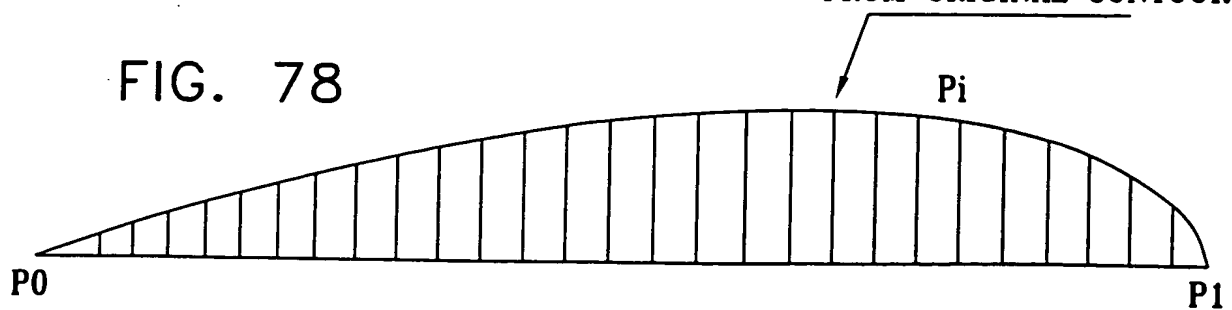


FIG. 79

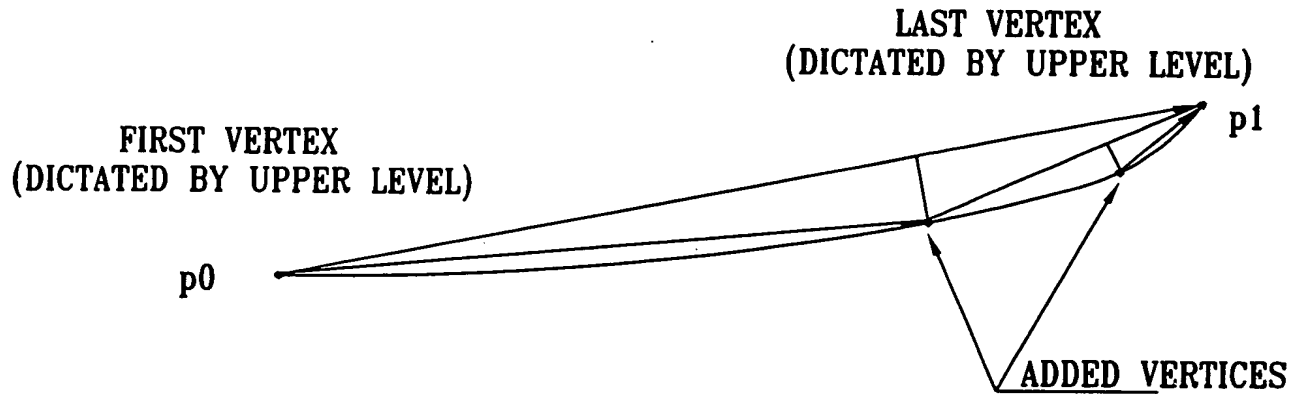


FIG. 80

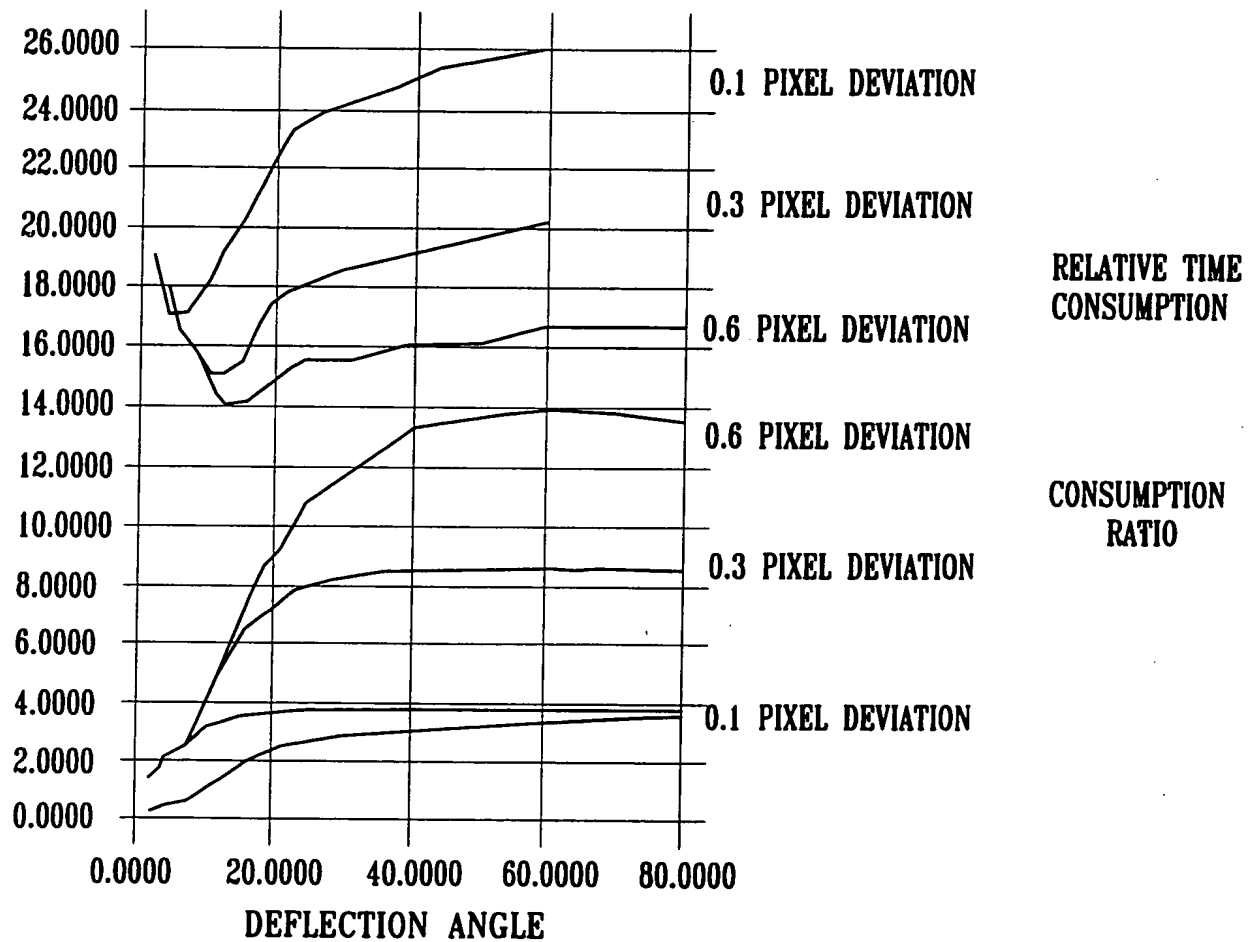


FIG. 81

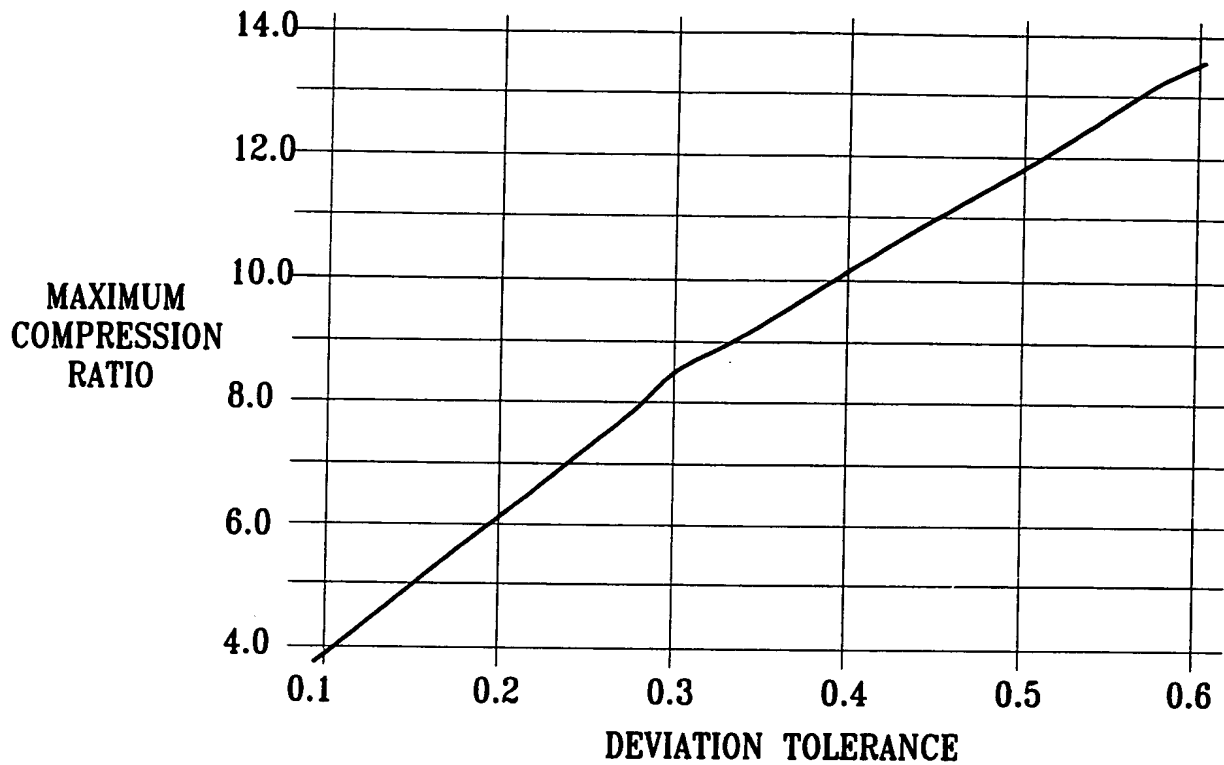


FIG. 82

